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THE ARCHITECTURAL RECORD

1935

8

HOUSE DESIGNS • NEW HOUSE CONSTRUCTION SYSTEMS AND EQUIPMENT

AIR CONDITIONING SYSTEM

in the Boston Department Store of William Filene's Sons Company

This year-'round air conditioning system, covering the entire main store and several annex buildings, was welded with AIRCO gases, apparatus and rods.

The principal reasons leading to the decision to weld this system, were these:

1. **Welding simplified a number of installation problems created by unusual conditions in the store.**
2. **The comparative lightness of welded pipe and fittings made possible a highly desirable saving in weight.**
3. **Welding solved the problem of fittings for the many unusual angles and bends for which no standard fittings were available.**
4. **The smoothness of welded joints and absence of flanges simplified and reduced the cost of insulating the system.**
5. **Welding assured the *permanently leak-proof* installation which possible damage to goods and enclosure of much of the piping in the walls, made imperative.**

The accompanying pictures give an idea of the extent and complexity of the piping. In all, some 14,000 feet of pipe, ranging in diameters from ¾″ to 14″, make up the system. The welding, amounting to approximately 35,000 linear inches, was all done with AIRCO oxygen, acetylene, apparatus and welding rods.

Credit for the successful completion of the welding of this installation is due the following:

Piping Contractor: P. McMurray Company, Boston, Mass.

Welding Contractor: Star Welding Company, Boston, Mass.

Write for "THE FACTS ABOUT WELDED PIPING"

AIR REDUCTION SALES CO.

General Offices: 60 East 42nd St., New York, N. Y.

DISTRICT OFFICES and DISTRIBUTING STATIONS in PRINCIPAL CITIES

A NATION-WIDE WELDING and CUTTING SUPPLY SERVICE

THE ARCHITECTURAL RECORD

VOLUME 78 NUMBER 2 AUGUST, 1935

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PLEASANT • COLORFUL • STURDY • ECONOMICAL

HOUSES of STUCCO

WHEN it's a home, possibly financed on a pretty strict budget, the architect who specifies a finish of white portland cement stucco is an architect who will have a satisfied client—now and years from now. • Stucco, as it is made and applied under today's specifications, is a finish particularly fitted to home building—both for new construction and for modernizing. • First of all, portland cement stucco is a durable, strong finish—actually it is a thin wall of concrete, and is comparably permanent, weatherproof and fire-resistant. • Second, stucco is applied in any texture suited to the architectural design—floated to a smooth finish, troweled in various semi-smooth effects, tooled, stippled, spatter-dashed, rough torn, or treated in other pleasing ways. • Third, with a finish coat made with *white* portland cement, *any color* is available in stucco—from pure white, through pastel tints of cream and salmon and tan and pink, to rich warm yellows and browns and greens and other shades. • Durability, texture, color—these are stucco's prime advantages. And by the way—did you know that the preferred stucco today is *factory-prepared?* And have you the new 1935 stucco specifications? We'll be glad to send you a copy promptly—write Universal Atlas Cement Co. (*United States Steel Corporation Subsidiary*), 208 South LaSalle Street, Chicago.

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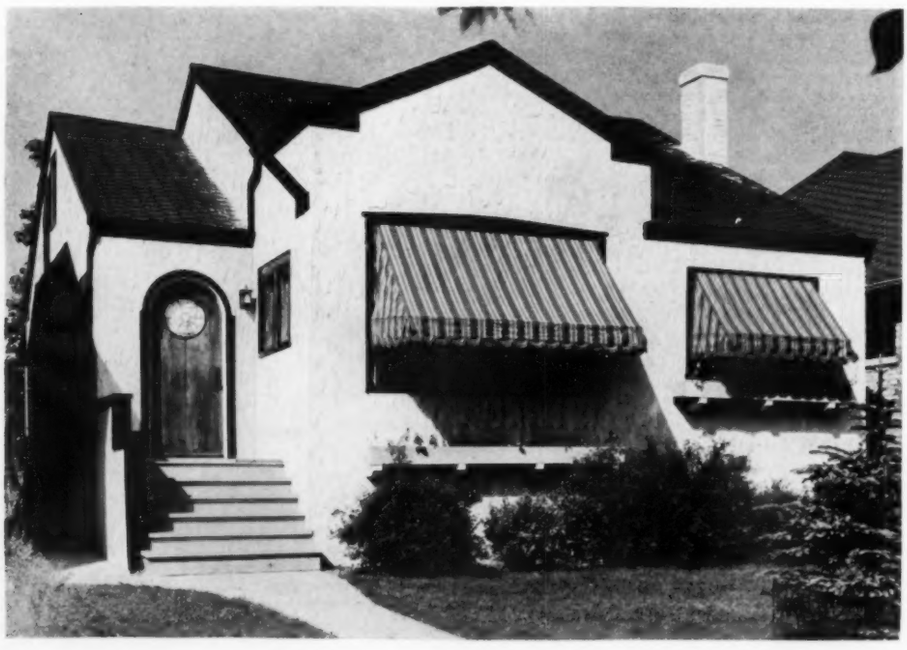
STUCCO *made with* ATLAS WHITE PORTLAND CEMENT



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This trim and tidy home has been modernized with an Atlas White portland cement stucco finish in a semi-rough texture.

THE ARCHITECT'S LIBRARY

1934 BUILDING AND LOAN ANNALS. *Edited by Morton Bodfish. United States Building and Loan League, Chicago, Ill.* 926 *pages.* $5

The year 1934 brought numerous important developments in home mortgage finance-expansion of the Federal Home Loan Banks, beginnings of Federal savings and loan associations, amendments to the Home Owners' Loan Corporation, mutual mortgage insurance, insured modernization loans, and share insurance for thrift and home financing institutions. *Building and Loan Annals of* 1934 is an effective attempt by the United States Building and Loan League to gather the facts and opinions about these instruments into one volume. Contributors include Chairman Henry B. Steagall of the House Banking and Currency Committee, Roger W. Babson, Deputy Housing Administrators Albert L. Deane and J. Howard Ardrey, Senator John H. Overton of Louisiana, and Chairman John H. Fahey of the Federal Home Loan Bank Board.

A considerable portion of the *Annals* is statistical. The state-by-state summaries of building and loan assets, members, number of associations, the amount of mortgage loans held and amount made in 1933, and the safety statistics are in tabular form. The principal asset and liability items from their consolidated balance sheets are also tabulated.

All Federal legislation which affects the flow of mortgage money is either reviewed or reprinted from the statute. All portions of new state laws which bear upon the operation of home mortgage institutions, the moratoria on foreclosures and tax collections, and enabling legislation for federalization of state-chartered associations are summarized in the legislative section. All court decisions rendered during the past year to determine building and loan association shareholder relationships and rights of associations in their contacts with government are briefed.

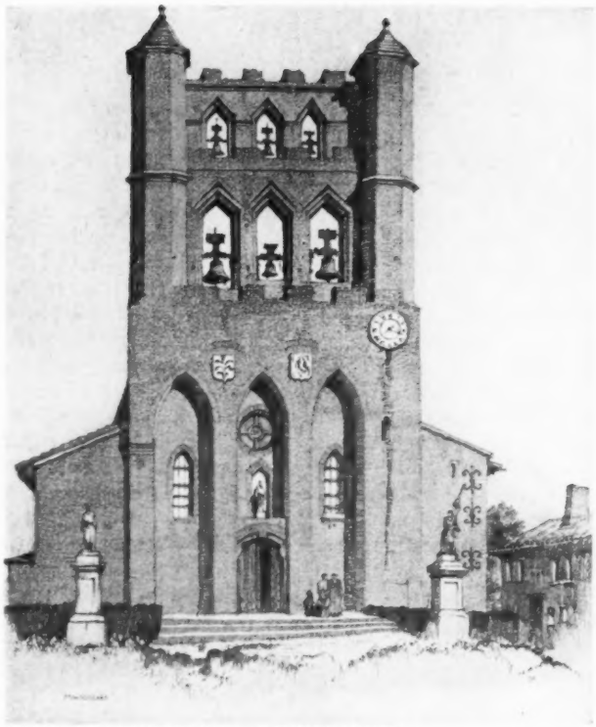
HOUSING PROBLEMS AND POSSIBILITIES IN THE UNITED STATES. *By Frank Watson. Harper and Brothers, 49 East 33rd Street, New York City.* 100 *pages. Charts.* $1.25

The current interest in improved housing as part of the recovery program lends interest to this book. The author, an attorney, has held a number of important posts in Washington, including special work on the President's Housing Program; he assisted in the drafting of the National Housing Act and was for a time Acting General Counsel for the Federal Housing Administration.

Special attention is given to the home mortgage situation and to the respective merits and shortcomings of banks, insurance companies, and building and loan associations. The new government housing problem is explained and appraised. The text is supplemented with statistical tables and graphs.

BEGINNING PROBLEMS IN MECHANICAL DRAWING. *By Charles A. Bennett. The Manual Arts Press, Peoria, Illinois.* 92 *pages. Diagrammatical illustrations.* 48*c.*

An elementary text emphasizing study of each problem before beginning work; at the same time it stresses the need for a higher standard of technique.



From BRICK IN FRENCH ARCHITECTURE

THE CHURCH OF MONTGISCARD

THE USE OF BRICK IN FRENCH ARCHITECTURE—THE MIDI. *By William Emerson, F.A.I.A., and Georges Gromort, D.F.L.G. Drawings by Samuel Chamberlain. Architectural Book Publishing Company, Inc., 112 West 46th Street, New York City.* 94 *pages. Illustrated.* $6.50

The mass of material available on French brickwork has led the authors to divide the country geographically in order to cover the subject as thoroughly and clearly as possible. Six volumes are planned, as follows: (1) Midi, (2) Centre, (3) Normandie, (4) Ile-de-France, (5) Flanders, (6) Modern French Brickwork.

The first section covers such subjects as the city of Albi and its famous Cathedral and Archbishop's Palace, the town of Gaillac and its brick buildings, Montauban, the churches and chateaux of Toulouse and the surrounding region, and Perpignon with its Cathedral of Saint-Jean-Baptiste. There are many excellent illustrations and working drawings, in addition to Mr. Chamberlain's sketches.

MODERNIZING THE KANSAS HOME. *By H. E. Wichers, Assistant Professor of Rural Architecture. Kansas State College, Manhattan, Kansas.* 133 *pages. Illustrated. Free to any citizen of the State of Kansas; sent to others at the discretion of the Director.*

This is Bulletin No. 32 of the Engineering Experiment Station of Kansas State College, under the direction of R. A. Seaton. Modernizing schemes and ideas, including detailed plans, are suggested for houses, classified as nearly as possible into groups or types; the scope of the bulletin is limited to the solution of some of the fundamental problems of plan arrangement and to some suggestions on exterior design. The author also discusses present-day trends in home design in regard to the interior, taking into consideration the individual rooms, porches, floors, stairs, fireplaces, lighting fixtures, basements, closets and so on.

REAL PROPERTY INVENTORY OF THE CLEVELAND METROPOLITAN DISTRICT. *Report No. 4.*

Cleveland, first city to have a comprehensive real property inventory, appears also to be the first large city to gets its inventory put upon a continuous basis by means of the financial support of business interests of the community. Vacancy-occupancy statistics and other important data on property, mortgages and population are now available for three successive years, 1932, 1933 and 1934, the surveys having been made in October of each year. These annual surveys are independent of the one made in the spring of 1934 by the Bureau of Foreign and Domestic Commerce. Through arrangements with the U. S. Post Office Department and the post offices in Cleveland and surrounding towns, the field work has been carried through by mail carriers, under the supervision of the Real Property Inventory Director, Howard Whipple Green, and the Advisory Committee. The project receives financial support from the Cleveland Clearing House Association, the daily newspapers, the public utilities and other business interests.

The latest report gives much more data on industrial space than was covered in previous surveys, and also shows a gratifying improvement in occupancy in other classes of buildings.

The chairman of the Real Property Inventory is Raymond T. Cragin, of Cragin, Morris & Company, Realtors, and its headquarters are located at 1900 Euclid Avenue.

DAS EINFAMILIENHAUS. *Südtyp. Grundsätzliche Studien und Entwürfe. By Alexander Klein. ("Wohnbau und Städtebau" Bd. 1). Julius Hoffman Verlag, Stuttgart.* 130 *pages.* 450 *illustrations. RM* 12

This book is the first to be published of a series dealing with house design and city planning; it concerns the one-family house with southern exposure, giving "basic principles and designs."

The author reasons that the one-family house of today is comparatively small; it must be low in cost yet high in service qualities. Every possible opportunity should be realized for maximum sunlight and the house, while presenting a good appearance on the street side, should be built facing a spacious garden.

All the problems which the author has encountered are examined in elaborately painstaking detail and their solution sought by exhausting all possible variations of the basic plan type. By means of many explanatory drawings he then proceeds to show, with an energy that is more impressive than his logic, why some designs are esthetically more "pleasing" than the other variants.

MANUAL OF ACCOUNTING FOR ARCHITECTS. *By The American Institute of Architects, The Octagon, 1741 New York Avenue, Washington, D.C. Standard Document No.* 978. 132 *pages*

This manual and its accounting forms have been prepared by practicing architects who have combined their knowledge with material from standard accounting and bookkeeping texts. Its purpose is to state concisely the theory of accounting, indicate the general procedure of keeping accounts, and describe a practical system of accounting that will record the usual financial transactions of the architect's practice and present the essential cost data and information.

Although the records of the construction accounts are entirely separate from the architect's accounting system, they are discussed fully, and appropriate bookkeeping forms are included in the appendix. The appendix contains a complete schedule of accounts and a series of thirty-eight plates of practical bookkeeping and accounting forms.

DRAWINGS AND DRAFTING ROOM PRACTICE. *Approved by American Standards Association. The American Society of Mechanical Engineers, 29 West 39th Street, New York City.* 24 *pages. Illustrated.* 50c

The Society for the Promotion of Engineering Education and The American Society of Mechanical Engineers are joint sponsors of this standard.

In general this standard follows the prevailing present practice as indicated by majority votes on several questionnaires and approvals of preliminary reports of working subcommittees. The items covered include the arrangement of views, line work, dimensioning, sheet sizes, and lettering, with detailed illustrations for each, clearly presented. The material is excellent.

MEMOIRS OF THE AMERICAN ACADEMY IN ROME. VOLUME XII. 1935. 184 *pages.* 17 *plates*

The first part of the book, The Origins of the *Insulae* at Ostia, is contributed by Philip Harsh.

Frank E. Brown writes on the structure and details of The Regia.

The Archaelogical Evidence for the "Tuscan Temple" is contributed by Agnes Kirsopp Lake, with consideration of the temples which have been used as examples of the triple-cella type. There is a list of all the temples of the Republican period which the author has been able to find that are sufficiently well preserved to supply any measurements.

Several plates illustrate the house of Marcus Loreius Tiburtinus at Pompeii: restoration by Thomas D. Price, text by A. W. Van Buren.

MODERNIZING BUILDINGS FOR PROFIT. *By Kenneth Kingsley Stowell. Prentice-Hall, Inc., 70 Fifth Avenue, New York City.* 231 *pages. Illustrated.* $6.50

This book deals with factors to be considered in deciding whether or not it will be profitable to modernize a particular building. Types of modernizing and the amount of work necessary are discussed and then follow chapters on particular types of buildings—the home, apartments, hotels, restaurants and bars, shops and stores, office buildings, theaters—with modernizing suggestions and checklists for each. Case histories feature "before" and "after" views of these building types, giving descriptive details of the modernizing.

BUILDING TO THE SKIES: The Romance of the Skyscraper. *By Alfred C. Bossom, M.P., F.R.I.B.A. The Studio Publications, Inc., 381 Fourth Avenue, New York City.* 152 *pages. Illustrated.* $4.50

In this book Mr. Bossom writes not merely as an architect but rather as a narrator—in non-technical language—of the growth and development of the skyscraper. Starting with the inventions and economic conditions that led to skyscraper construction, he discusses the early designers and their problems—foundations; strains and stresses; the qualities, properties, weight-carrying and resistance power of iron and steel; the technical uses of the then new materials.

NEWS OF THE FIELD

Julius Boenisch, architect, has moved to 3380 Fulton Road, Cleveland, Ohio.

Robert Helmer, architect, formerly of the firm of Halsey, McCormack and Helmer, Inc., 286 Fifth Avenue, New York City, is now practicing independently at his new address, 1180 Fulton Street, Brooklyn.

Daniel Perry, architect, announces the opening of new offices at 1213 Main Street, Port Jefferson, Long Island, New York.

W. Lockwood Martling, Jr., architect, has opened an office for the practice of architecture at 239 South Cuyler Avenue, Oak Park, Illinois.

William B. Ittner, Inc., architects, have moved to their former quarters, Suite 408, Board of Education Building, 911 Locust Street, St. Louis, Missouri.

Michael Rapuano is now an associate in the firm of Vitale & Geiffert, Gilmore D. Clarke, landscape architects, 101 Park Avenue, New York City.

The Housing Study Guild has moved from 101 Park Avenue to 151 East 50th Street (between Third and Lexington Avenues), New York City.

FEDERAL ARCHITECTS' EXHIBITION

The fourth annual exhibition of the Association of Federal Architects was held during July in the National Museum in Washington, D. C. A feature of the exhibition was the Association's gold medal which is to be given to the individual or firm practicing architecture in the United States that has made "the most outstanding contribution for the ensuing year to Federal architecture."

ERRATA

The Curtis Furniture Store, New York, illustrated on page 50 of the July issue, was incorrectly attributed to J. Lewis Sinclair, architect. This store was designed by Ben Schlanger, architect.

In the editorial introduction to "Analysis of Real Property Inventory Data for 65 Cities & Communities in New Jersey" by A. B. Randall (pages 35 and 36 in the July issue) omission was made of the fact that this survey was conducted by the State Housing Authority of New Jersey.

MEMORIAL AUDITORIUM COMPETITION

The Marietta, Ohio, City Hall Competition, which was announced on this page in the July issue, has been changed as to dates. There will be two stages, approximately 60 days each, beginning about August 20. The first stage will require simple drawings at small scale and will be open to A.I.A. members in good standing any time since January 1, 1933. The second stage will be open to six chosen from first stage. Prospective competitors should apply to the architectural adviser, Howard Dwight Smith, Department of Architecture, Ohio State University, before August 10.

CALENDAR OF EXHIBITIONS AND EVENTS

August 12	Closing date for Modernize-Main Street competition conducted by The Architectural Record and sponsored by the Libbey-Owens-Ford Glass Company of Toledo.
August 26	Jury judgment of entries in Modernize-Main-Street competition conducted by The Architectural Record and sponsored by the Libbey-Owens-Ford Glass Company of Toledo.
September 16	Closing date for entries in "Terra Cotta Wall Block Competition," sponsored by Chicago Architectural Club, 1801 South Prairie Avenue, Chicago.
October 10-19	Architectural League Exhibition, Grand Central Palace, New York City.
October 15	Closing date of eighth annual small house competition conducted by House Beautiful magazine, 572 Madison Avenue, New York City. Rules and conditions sent on application.
1936	
January 27-31	Fourth International Heating and Ventilating Exposition, Chicago.

M. I. T. CLASS TO BUILD HOUSE

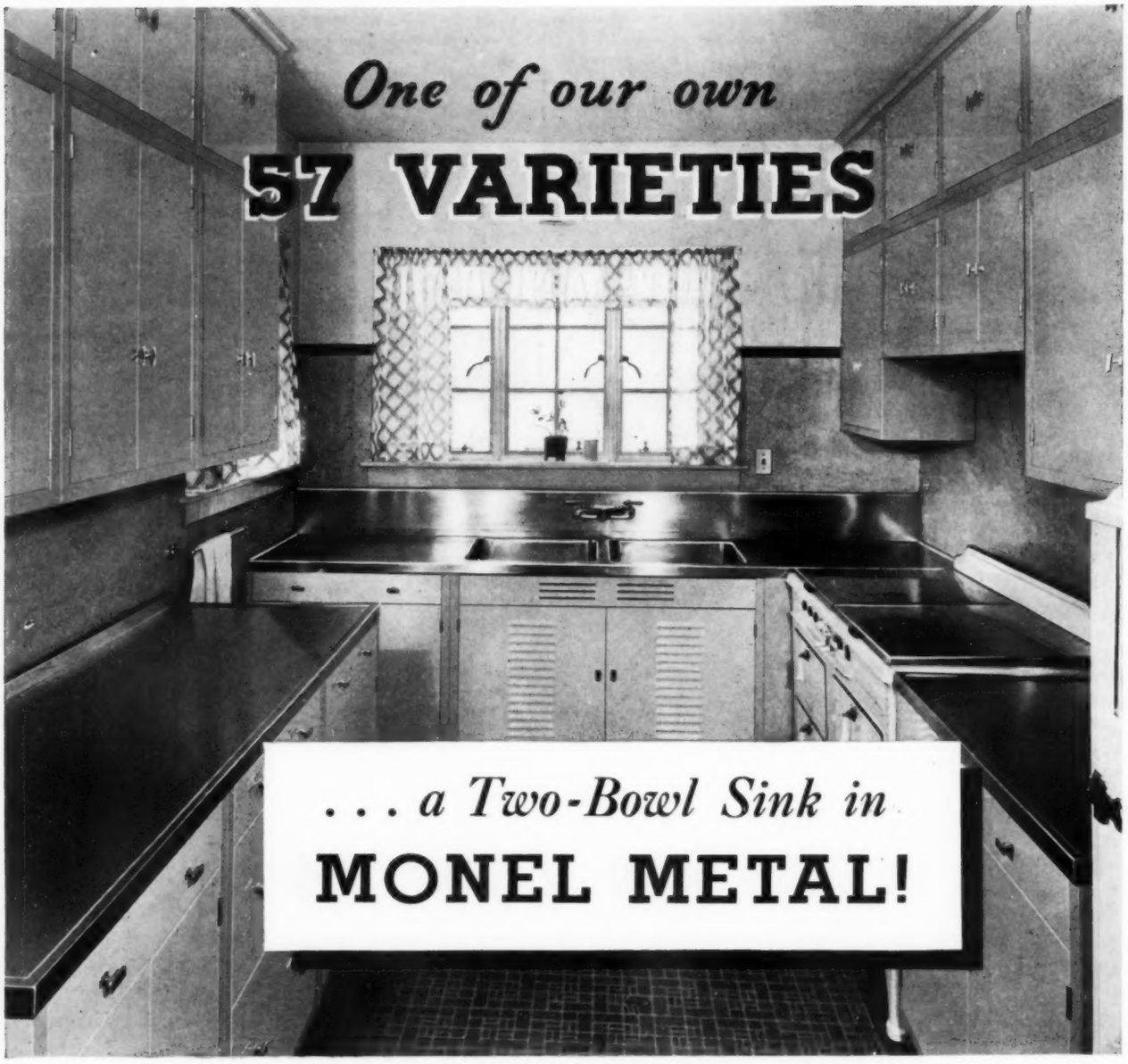
The realities of planning and supervising the construction of a modern house will be introduced in the first year course of the school of architecture of the Massachusetts Institute of Technology beginning next autumn, Dean William Emerson announces. The work will include the selection and purchase of a suitable lot, making plans and specifications for a moderate size house, selecting a building contractor, and supervision of every step of construction. The plan will be carried out with the assistance and supervision of the faculty, and when completed the house will be sold and the proceeds used to purchase a new location and finance the building of another house for the next year's class.

TOWN PLANNING COURSE AT COLUMBIA

The School of Architecture at Columbia University will open a new studio of Site Planning, beginning with the fall semester of 1935. The studio will be conducted by Henry Wright, who has been acting as town planning adviser to the faculty since February. Problems in design will concentrate on the study of form and space relationships, largely in respect to the external factors of architectural and community organization.

SLUM CLEARANCE PROJECTS

A new and more liberal basis for financing Federal slum clearance and low-rent housing projects under the Public Works Administration program was announced on July 8 by Administrator Harold L. Ickes. The new regulations provide that the recently authorized PWA grant of 45 per cent shall apply to slum clearance and low-rent housing projects. The remaining 55 per cent of a housing allotment is to be construed as a loan to the project, to be amortized by rents. Interest to be charged on the loan section of the allotment is not to exceed 3 per cent. Amortization of the loan is to take place over a 60-year period. Land cost will not be amortized, but a 3 per cent annual land rent item will be carried by each project.



This double-bowl sink is one of those things that makes a hit with clients. In the kitchen, the extra bowl comes in handy for cleaning vegetables—while the other harbors pots and pans. In the pantry, one bowl for washing and the other for the hot water rinse.

Apologies to Mr. Heinz for our highhanded seizure of his number. But it turns out that 57 is exactly the number of models we need to satisfy every conceivable sink and cabinet requirement.

And in some of these models, we go to almost any length to please you. For example, you may specify the sink illustrated above in any length from 46" to 144" *in fractions of an inch.* In other words, we cut the sink to fit the kitchen, instead of asking you to alter the kitchen to suit the sink.

Having decided on the length, you will discover that you have a free hand in writing the other sink specifications. We manufacture both cabinet models and apron type sinks. Specify the latter with low backs or high backs—with smooth drainboards or grooved drainboards—with square or rounded corners.

The long and the short of standard Monel Metal cabinet sink units. The big fellow is 144" long, the little one 48" long.

And if you want to throw in a Westinghouse dishwasher, that can be installed in our standard cabinet sinks without alteration. In short, there are practically no limitations in Monel Metal—nothing to hinder you from giving your client *your idea* of a perfect sink.

For complete information and prices on Monel Metal sinks, get in touch with the distributors, Whitehead Metal Products Co. of New York, Inc., 304 Hudson St., New York, N. Y., or their branches in principal cities.

• • •

THE INTERNATIONAL NICKEL CO., INC.
67 WALL STREET NEW YORK, N. Y.

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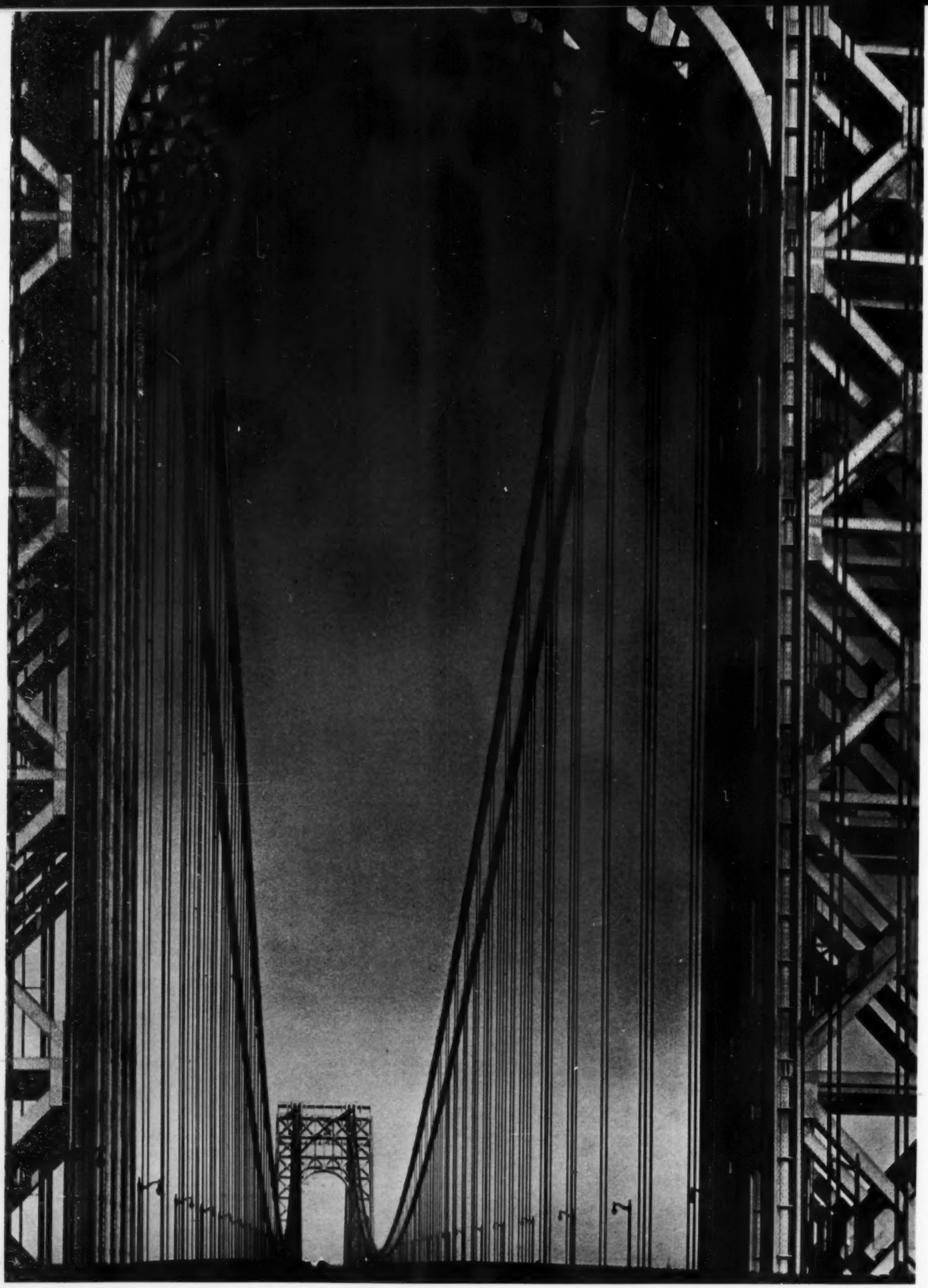
NEXT MONTH:

SCHOOLS AND SPECIAL BUILDING TYPES



GEORGE WASHINGTON BRIDGE OVER HUDSON RIVER . . . . PHOTOGRAPH BY MARGARET BOURKE-WHITE

VOL. 78 NUMBER 2

1935

AUGUST

THE

ARCHITECTURAL RECORD

MODERATE-COST PRIVATE HOUSES

This issue of THE RECORD is devoted to moderate-cost private houses. It gives a survey of current practice and trends in private house architecture with reference to principles, methods, materials and equipment, incorporating new developments in their several technical relationships.

●

Evidence of professional attention to a field heretofore neglected, namely low-cost residence architecture, is seen in a competition by the New York Chapter of the A. I. A., the conditions and results of which merit special study. The competition permitted ample freedom of invention in planning, constructing and equipping a house for a family of four with income and resources warranting a construction cost of $4,000 or less. This study-competition, limited to chapter members and participated in by well-known architects, is believed to be the first of its kind. It is hoped that similar competitions will be held by other chapters. There are probably few chapter activities so promising of practical benefit to the profession and to the public as critical study of low-cost private house architecture.

The survey further discloses a remarkable variety of construction methods experimented with partly on the initiative of architects and partly on the initiative of manufacturers. A dozen such methods worth recording are used in houses newly completed or sufficiently far advanced to be photographed for this issue.

Two prefabricated house systems recently placed upon the market have achieved wide popular interest. The list of prefabricated house systems now marketed under trade names is impressive until one begins to analyze the term "prefabricated." An automobile is prefabricated in the sense that it is assembled in a factory from factory-made parts. This mode of assembly is out of the question as regards houses of any size intended for fixed locations. The prefabricated house is merely a new name for the old stock house.

There is no difference in construction principle between prefabricated or stock houses and houses designed by architects for individual clients. They are all assembled with more or less hand labor on the site from manufactured parts. If an architect specifies a brick wall he is using manufactured materials as against the more highly integrated manufactured wall panels of the stock house.

Every essential item which goes into a stock house can be bought in the open market. Even the most recent mechanical core, which combines the lighting and air conditioning plant, the fabricated bathroom, the fabricated kitchen, and the plumbing into a compact structural unit, can be so bought. There is no doubt a price differential on parts in favor of the wholesale buyer. On the other hand, the wholesale buyer who assembles the parts has to pay a heavy commission on the sale of the house. The stock house is essentially an installment selling device and it has yet to be demonstrated which is the more economical investment for a home buyer—a stock house on the installment plan or an architect-designed house on an amortized mortgage.

The survey offers no direct evidence on comparative costs. However, the specialists whom the editors have consulted are agreed that a more livable moderate-cost house can be designed today for, say, $5,000 to $10,000, than could have been designed before the depression began. To obtain the improved livability it will probably be found as a rule to be less expensive to design a new house than to redesign an old one.

EIGHT MONTHS' CONTINUOUS RISE IN PRIVATE HOUSE CONSTRUCTION

Beginning with October of last year, when the number of new residential projects built for owner's occupancy showed an increase over the total for the corresponding month of the preceding year, there has occurred a consistent and almost spectacular increase in this type of construction. Each month since then has shown a greater gain over the corresponding month of the preceding year than prevailed during the previous month. The October gain amounted to 9 per cent and by the end of the quarter the cumulative increase had risen to 18 per cent.

During the first five months of 1935 this improvement continued uninterruptedly with the result that the total number of single-family structures started during this period showed an increase of 74 per cent over the number started during the corresponding five months of 1934. The current rate of activity has now risen to the level which prevailed during the first half of 1931.

The average contract price of the houses for the five months of 1935 in the accompanying table supplied by Dodge Statistical Research Service is $6,050. The June figures, incomplete at this writing, continue the trend of the preceding eight months.

The significance of this table is to be interpreted in the light of such factors as (1) available mortgage money, (2) construction cost in comparison with the general price level, (3) purchasing power or effective demand, (4) supply.

The home mortgage market collapsed during the depression. It has now been completely reorganized on principles briefly set forth in this issue under the heading, "Standards for Mortgage Insurance." In the last several months enough mortgage money has become available to supply any effective demand for moderate-cost private house building.

The cost of construction relative to the general price level is usually measured by the price index for structural materials and the wage index for union labor. These indexes are used because no general index of the cost of construction exists. However, each building project is a separate cost problem, covering finance, site and equipment as well as structural materials and labor. Financing is undoubtedly less expensive than it has ever been, $10 a month being sufficient to pay both the interest and the entire principal of a $1,000 loan in ten to fifteen years. Equipment has been lowered in price, largely by introduction of mechanical units designed especially for moderate-cost houses. There is reason to believe that the aggregate cost of building a home is less both in comparison with the past and in comparison with the general price level than one is led to infer when consulting only the price index for structural materials and the wage index for union labor.

Purchasing power of the income groups that supply effective demand for moderate-cost private houses is a matter of opinion in the absence of statistical measurement. It is the outcome of employment and profits.

The condition of supply may be judged from the survey of residential property in 64 cities made by the Federal Government in January and February of 1934. The cities represent every State, range in population from 10,000 to more than 1,000,000 and their combined population exceeds 10,000,000.

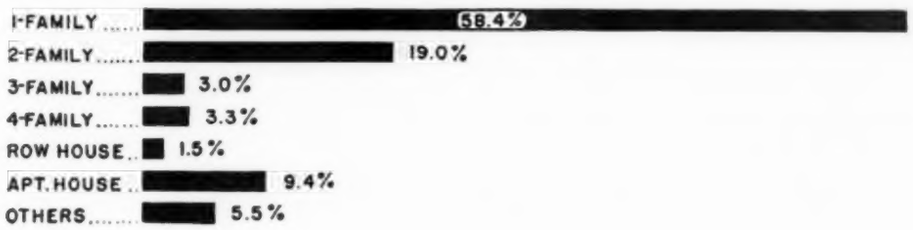
The findings are analyzed in an article entitled "Dwelling Conditions in Sixty-Four Cities" in the June 1935 issue of the Federal Home Loan Bank Review.

The article contains a series of charts which illustrate at a glance the principal aspects of the supply of dwelling units as revealed by the property survey. Six of the charts are reproduced on opposite page.

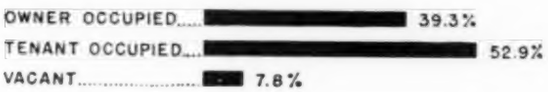
TOTAL NEW SINGLE-FAMILY HOUSES BUILT FOR OWNER'S OCCUPANCY: 37 EASTERN STATES (ALTERATIONS NOT INCLUDED)

	1933		1934		1935	
JANUARY	720	$4,347,600	482	$3,840,000	830	$5,185,100
FEBRUARY	765	4,060,300	599	4,438,300	923	5,328,300
MARCH	1,218	6,253,600	927	6,728,600	1,715	10,212,300
APRIL	1,612	8,543,300	1,322	8,543,900	2,408	14,312,200
MAY	2,272	11,953,500	1,560	9,333,700	2,786	17,338,700
JUNE	2,325	13,029,100	1,247	8,143,800		
JULY	2,288	12,907,300	1,192	7,619,400		
AUGUST	1,996	11,934,300	1,199	6,981,100		
SEPTEMBER	1,606	9,754,600	1,264	7,777,300		
OCTOBER	1,321	7,686,700	1,441	8,840,800		
NOVEMBER	965	6,160,100	1,097	6,854,500		
DECEMBER	571	4,062,700	824	5,206,500		
TOTALS	17,659	$100,693,100	13,154	$84,307,900	8,662	$52,376,600

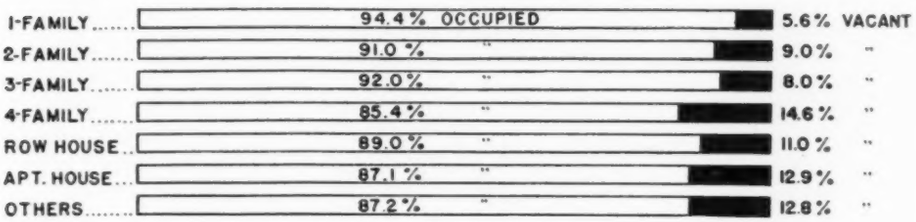
PERCENTAGE DISTRIBUTION OF 2,633,135 DWELLING UNITS IN 64 CITIES, BY TYPE OF STRUCTURE



DISTRIBUTION OF 2,633,135 DWELLING UNITS IN 64 CITIES BY OCCUPANCY

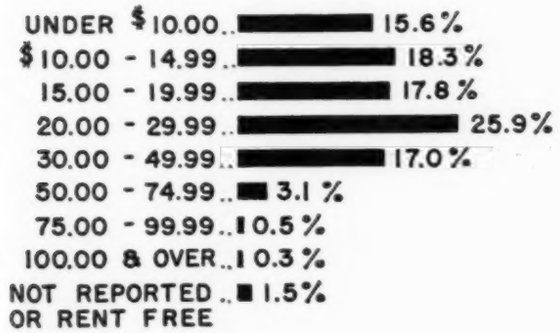


DISTRIBUTION OF OCCUPANCY AND VACANCY BY TYPE OF STRUCTURE

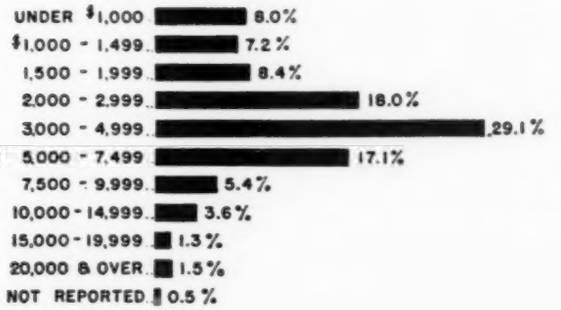

1-FAMILY 94.4% OCCUPIED 5.6% VACANT
2-FAMILY 91.0% " 9.0% "
3-FAMILY 92.0% " 8.0% "
4-FAMILY 85.4% " 14.6% "
ROW HOUSE 89.0% " 11.0% "
APT. HOUSE 87.1% " 12.9% "
OTHERS 87.2% " 12.8% "

OCCUPIED AND VACANT DWELLING UNITS IN 64 CITIES CLASSIFIED AS TO CONDITION OF STRUCTURE

DISTRIBUTION OF OCCUPIED RENTAL UNITS BY MONTHLY RENTAL



DISTRIBUTION OF OWNER-OCCUPIED SINGLE-FAMILY DWELLINGS BY VALUE, JANUARY 1, 1934



STANDARDS FOR MORTGAGE INSURANCE

The Federal Home Loan Bank Act and the National Housing Act with supplementary legislation have created a Federal system of mortgage banking in the field of home finance. The system was in full operation in the closing month of last year, lacking only conforming State legislation to be completely effective.

The system permits building loans up to 80 per cent on houses for not more than four families and not exceeding with the land $20,000 in value, this high coverage being coupled with a low interest rate because the mortgages are (1) amortized, (2) discountable and (3) eligible for insurance by the Federal Mutual Mortgage Insurance Corporation.

The high-coverage insurable mortgage is designed to supersede the home finance method in common use before the depression. By this method a thrift institution accepted a short-term first mortgage while a junior mortgage was taken by a concern financing sales by operative builders. The great majority of thrift institutions—building and loan associations, life insurance companies, savings banks and the like—operate under State charters and are subject to State laws. As a rule such laws prevented thrift institutions from lending more than 50 per cent of appraised value.

Up to January 21 of this year only two States had revised their laws to enable thrift institutions to make high-coverage loans on mortgages insured by the Federal Mutual Mortgage Insurance Corporation. By June 15 the list of States had grown to 42. The timing of the conforming State legislation corresponds suggestively with the rise in the monthly construction figures for the current year in the table on page 76.

Of the mortgages accepted for insurance up to June 29 thirty-six per cent in dollar volume represented new construction, not including limited dividend housing. In June mortgages for refinancing and for new construction were accepted for insurance at the rate of $2,800,000 a week as against a total of $24,100 for the period of operation before December 29, 1934.

The total of insured mortgages, not including mortgages on limited dividend housing, as of June 29 was $37,637,068.

The demand for insurance is now so well established that the former variable premium has been reduced to a flat rate of one-half of one per cent per annum of the original face value of all classes of mortgages. The former variable maximum interest rate allowed has also been reduced to a flat rate, namely, 5 per cent per annum on the amount outstanding.

Mortgages were accepted for appraisal in June at the rate of 7,100,000 a week. Of the mortgages accepted throughout the entire period of operation 16.9 per cent have been rejected for insurance. The high percentage of rejections suggests that the standards of eligibility are exacting and that they are being enforced.

The National Housing Act, which authorized the Federal Housing Administrator to establish the Federal Mutual Mortgage Insurance Corporation, is general in its terms. It obligated the Administrator to build an organization and to adopt standards of eligibility for insurance. Problems related to valuation, risk rating and property management were intrusted by the Administrator to James B. Dusenberry, who organized the Underwriting and Realty Division and formulated its rules and regulations.

The Division is organized into several sections, including the Underwriting Section, which has charge of matters pertaining to the eligibility of mortgages for insurance; the Placement Section, which has charge of the selection of technical personnel; the Realty Section, which has jurisdiction over the management and resale of acquired real estate, and several other sections.

Last Fall arrangements were made for the selection of qualified men to serve on the underwriting staffs of the field insuring offices. A picked group of 280 men were brought to Washington in November to attend a school of instruction. Of these, fifty-seven were qualified architects; the rest were qualified appraisers and mortgage men.

There are sixty-three insuring offices. Each has a salaried staff, supplemented by fee architectural inspectors and fee valuators. The risk rating of the mortgage, based on examinations by specialists reporting on separate categories of risk, is determined by the chief underwriter in the insuring office.

Five principal categories of risk are analyzed. These are: (1) property, (2) neighborhood, (3) relation of property to neighborhood, (4) the borrower and (5) the mortgage pattern.

The duties assigned to architectural inspectors fall into two parts: (1) the rendering of the Report of Architectural Inspector and (2) the making of reports on inspections during construction.

The Report of Architectural Inspector calls for two major conclusions, the first of which is the Rating of Property, and the second the Estimate of Cost Required to Replace Improvements in New Condition.

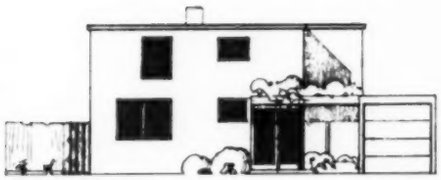
In rating the property the architectural inspector gives consideration to the risks introduced by varying degrees of quality displayed by eleven factors in a form questionnaire or grid. This grid rating, when combined with four other ratings made by the valuator and mortgage risk examiner, enters into the final grade rating of the mortgage.

The valuator uses a similar grid to make a Rating of Neighborhood and still another to make the Rating of Relation of Property to Neighborhood. The mortgage risk examiner makes two ratings: the Rating of Borrower and the Rating of Mortgage Pattern.

The purpose of the foregoing paragraphs has been to indicate the importance of the insured amortized mortgage to private house construction and the relationship of the standards of eligibility for mortgage insurance to private house architecture. To attempt to give a working knowledge of the standards would be impracticable in a limited space. The required information is contained in the *Underwriting Manual* and other documents issued by the Underwriting and Realty Division, Federal Housing Administration, Washington, D. C. Nearer and better sources for specific problems are the district insuring offices, of which a list is given on page 88.

LOW-COST HOUSES . . . . . .

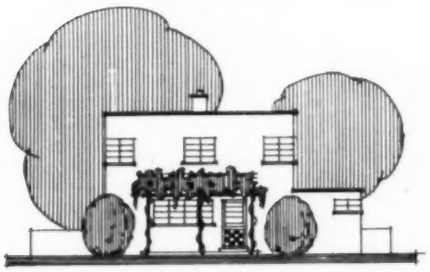
A STUDY COMPETITION CONDUCTED BY THE NEW YORK CHAPTER OF THE AMERICAN INSTITUTE OF ARCHITECTS



NORTH

FIRST PRIZE

J. ANDRE FOUILHOUX, ARCHITECT



GARDEN

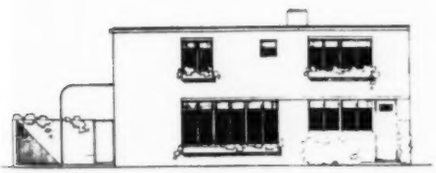
SECOND PRIZE

JOHN THEODORE HANEMAN, ARCHITECT

GARDEN

THIRD PRIZE

FREDERICK G. FROST, ARCHITECT



EAST

FOURTH PRIZE

J. ANDRE FOUILHOUX, ARCHITECT

Can decent and adequate individual houses be designed by architects for the lower income groups? This question was met by the New York Chapter by conducting a competition among its membership.

(1) No inherent problem confronts the architect in the design and construction of six-room houses costing $5,000 or more.

(2) On the other hand, the problem of individual houses of proper standards for the lowest income groups, namely, for families having a combined annual income of $1,200 or less, presents difficulties which are more than technical. This class, estimated by the National Housing Administration as representing one-third of the population of the United States, must receive Federal or other subsidy; and it is probable that much of the housing for this group will be multi-family or row houses.

(3) Housing is urgently needed by 9,968,000 families in the United States, as indicated by the last census.

Population of U. S., 1930	122,775,046
Estimated number of families	29,904,663
Average size of family (persons)	4.1055

(4) The type of house needed is one that supplies accommodations for four persons, namely, two adults and two children, and the total cost, including land, should not exceed $4,000. The competition program invited proposals for new construction methods and use of new materials where economy and improvement could be demonstrated. Four winning designs were submitted to reputable contractors in order to demonstrate the low-cost claim of the competitors.

The problem:

House for 4 persons (two adults and two children).
Cost not to exceed $3,200 exclusive of land cost.
Interior site, lot 50 feet wide by 100 feet deep, fronting on a street or road.
Orientation left to competitors.

First prize — design by J. Andre Fouilhoux:

This house is planned around a modulus unit adaptable to the use of prefabricated units when costs will have been brought down through economy in fabrication and quantity production. Outside wall studs with stucco on paper backed lath. Space between studs filled with rockwool bats, giving heat insulation as well as making the wall almost fireproof. Inside wall and ceiling surfaces plywood. Bathroom and kitchen asbestos board. Stairs built as outside unit to save expense of special framing. Economy in heating plant by having furnace centrally located with short duct runs and small horizontal propeller fan insuring positive circulation. Oil burner fed from bottle refilled from outside tank.

Second prize — design by John Theodore Haneman:

Possible construction systems: (1) Stucco on metal lath with terra cotta coping and plastic slate roof. (2) Brick veneer. (3) Stucco on terra cotta block with Truscon beams and Gypsteel planks. (4) Same with brick veneer instead of stucco. Estimated cost at 28¢ a cubic foot: $3,252.27.

Third prize — design by Frederick G. Frost:

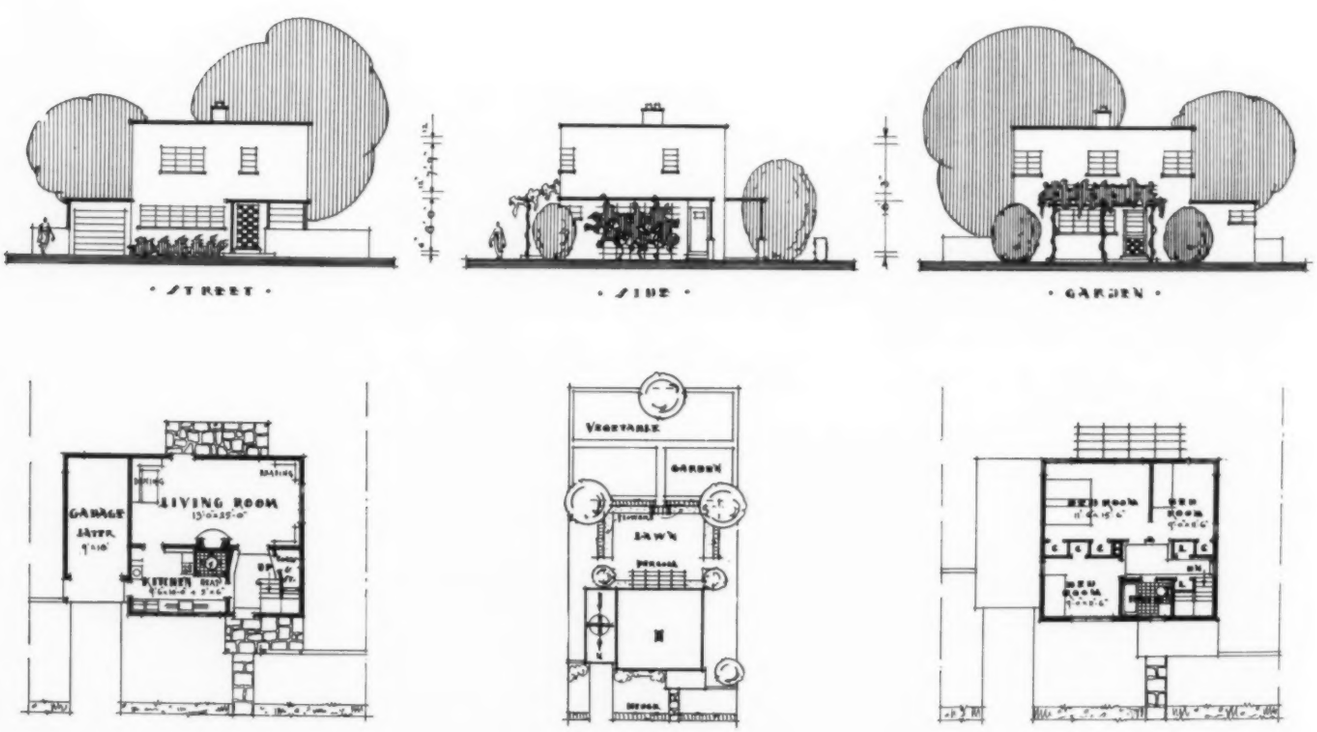
Wood frame with stucco on metal lath. Rockwool insulation. Plaster on metal lath. Asbestos shingle roof. Concrete block foundation. Total cubage: 11,990 cubic feet.

Fourth prize — design by J. Andre Fouilhoux:

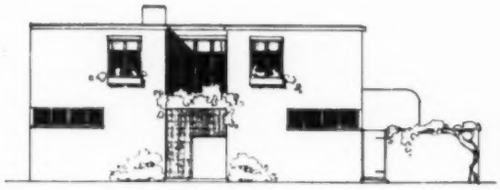
Solid brick or tile wall along lot line. Other walls of studs with stucco on paper backed lath with rockwool insulation. Cellular steel floor framing. Inside wall surfaces of plywood; bath and kitchen, asbestos board.

FIRST PRIZE: J. ANDRE FOUILHOUX, ARCHITECT

SECOND PRIZE: JOHN THEODORE HANEMAN, ARCHITECT

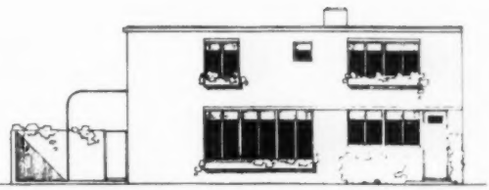


FOURTH PRIZE: J. ANDRE FOUILHOUX, ARCHITECT

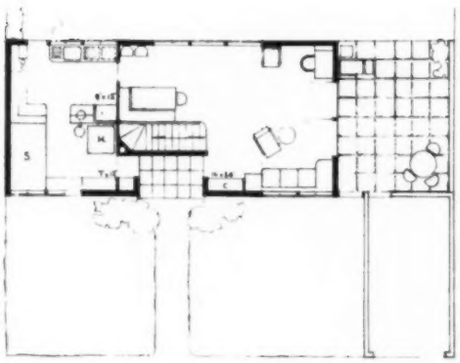


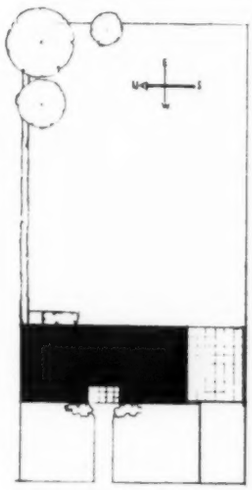
WEST

SOUTH

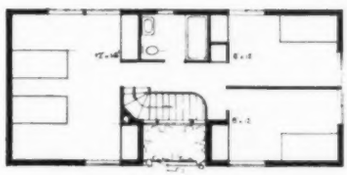


EAST





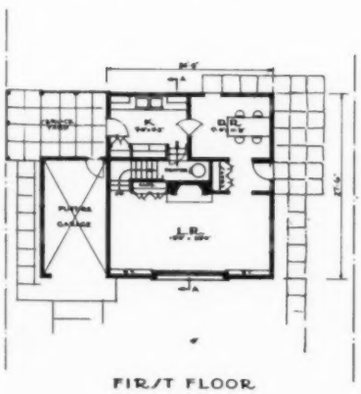
PLOT PLAN



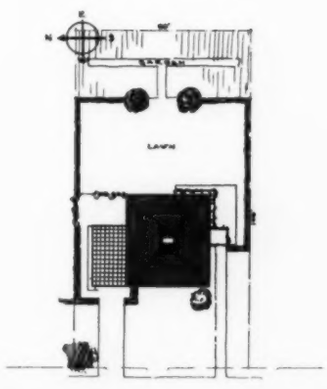
SECOND FLOOR

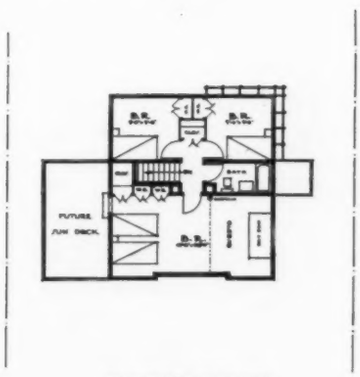
THIRD PRIZE: FREDERICK G. FROST, ARCHITECT

STREET SIDE GARDEN



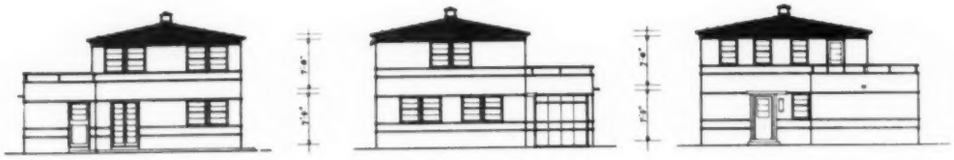
FIRST FLOOR





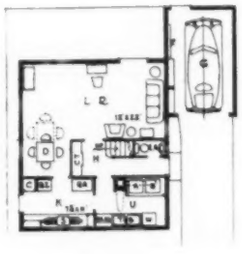
SECOND FLOOR

DESIGN BY
PHILIP L. GOODWIN
ARCHITECT

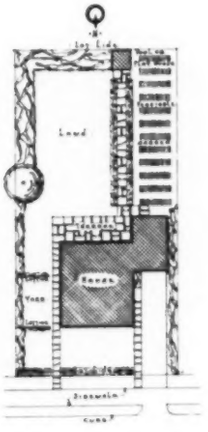


GARDEN FRONT | STREET FRONT | ENTRANCE SIDE

Foundations: concrete or cinder blocks. Studs: wood or metal. Sheathing: 1/2" Transite or similar materials. Roofing: painted tin or lead covered copper of standing seams. Windows: stock aluminum. Doors: wood painted (not stock). Interior floor beams: wood or metal. Floors: pine linoleum covered. Insulation: aluminum insulating paper. Heating: oil or gas burner; humidified air with summer circulation. This house can be built for $3,200 unless entirely fireproof, when it might exceed this cost slightly.



FIRST FLOOR PLAN



SECOND FLOOR PLAN

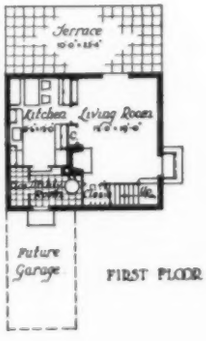
DESIGN BY
FRANK J. FORSTER
ARCHITECT

Foundation walls: concrete block. Exterior walls: painted 8" cinder block and double core furring. Floor framing: precast concrete joists and cinder slab filling with finish wood floors set in cement mastic. Roof: "corkanstele" construction with 3/16" slate finish. Interior partitions: double core steel studs with plaster board. Windows: stock steel casements. Air conditioning by means of a self-contained steam boiler, oil burner, fan, filter, and humidifier, controlled by hygrothermostats. Total cubage: 8,705 cubic feet.

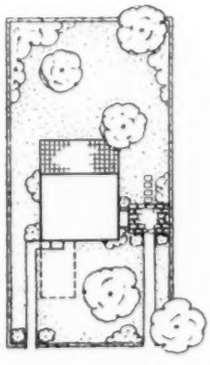
STREET ELEVATION

SIDE ELEVATION

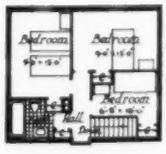
GARDEN ELEVATION



FIRST FLOOR PLAN

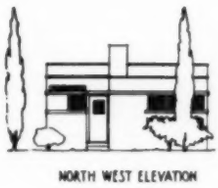


PLOT PLAN.

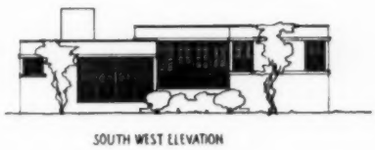


SECOND FLOOR PLAN

NORTH EAST ELEVATION



NORTH WEST ELEVATION

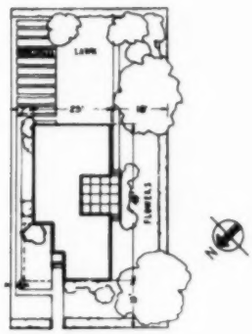


SOUTH WEST ELEVATION

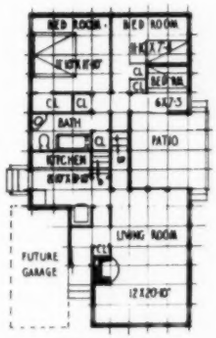
DESIGN BY
J. H. PHILLIPS
ARCHITECT

Foundation: poured concrete or concrete blocks. Exterior walls: steel channel studs, thermax or other gypsum manufactured panels. Partitions: precast reinforced 3-foot stock panels. Joists: trussed steel. Floors and roof: fine wire mesh and concrete slab. No forms necessary. Composition or wood floors. Composition roof floors and roof insulated. Interior walls and ceilings: covered with plaster paint. Total cubage: 10,216 cubic feet.

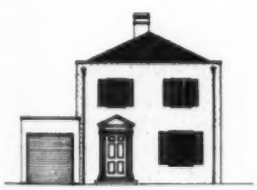
CELLAR PLAN



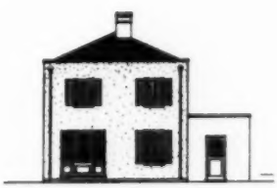
PLOT PLAN



FIRST FLOOR PLAN



·WEST ELEVATION·
Scale ⅛-1'-0"

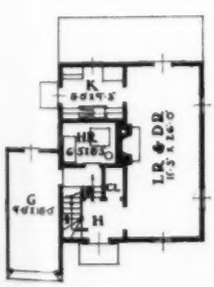


·EAST ELEV·

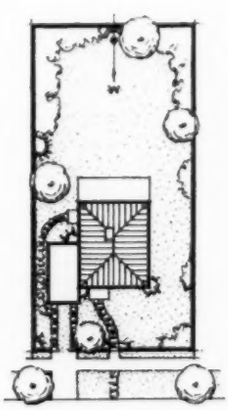
·SOUTH ELEV·

DESIGN BY
DWIGHT JAMES BAUM
ARCHITECT

Exterior walls: stucco on frame construction. Roof: copper left to weather. Stock window frames, blinds and entrance doorway. Overhead garage doors. Exterior walls and second floor ceiling insulated. Floors: oak strip. Walls and ceilings: plastered. Bath floor and wainscot: linoleum. Kitchen floor: linoleum. Warm air heating system. Total cubage: 12,055 cubic feet.



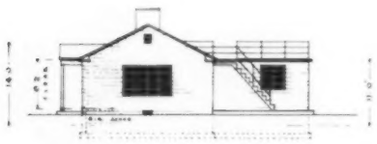
·FIRST FLOOR PLAN·



·SECOND FLOOR PLAN·

Exterior walls: cinder block, insulating lath and plaster. Partitions: 2" metal and plaster. Ceiling: insulating board. First floor: poured concrete or precast joists. Finished floors: asphalt tile or linoleum. Steel windows. Wood doors. Heating: forced hot air, with Vecto heater, fan and recirculating ducts. Oil burner (stove type) in Vecto heater. System can be used for summer cooling. Steel stairs to roof terrace. Total cubage: 13,740 cubic feet.

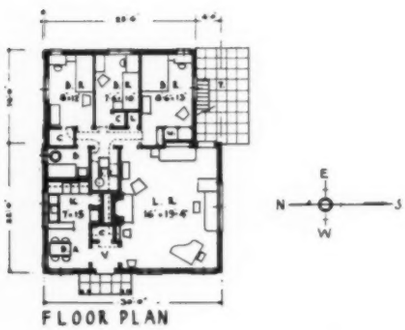
W. STUART THOMPSON, ARCHITECT



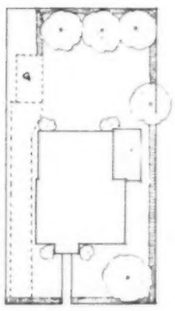
SOUTH E.

WEST E.

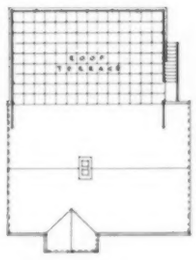
NORTH E.



FLOOR PLAN

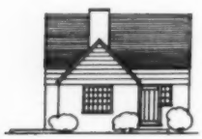


PLOT PLAN

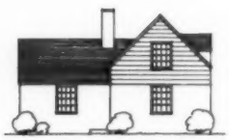


ROOF PLAN

LEWIS E. WELSH, ARCHITECT



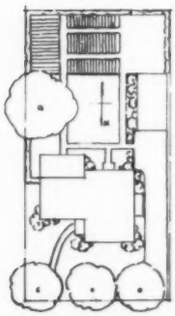
EAST ELEVATION

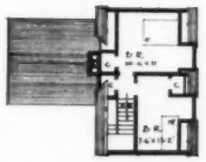


NORTH ELEVATION

WEST ELEVATION

FIRST FLOOR PLAN





SECOND FLOOR PLAN

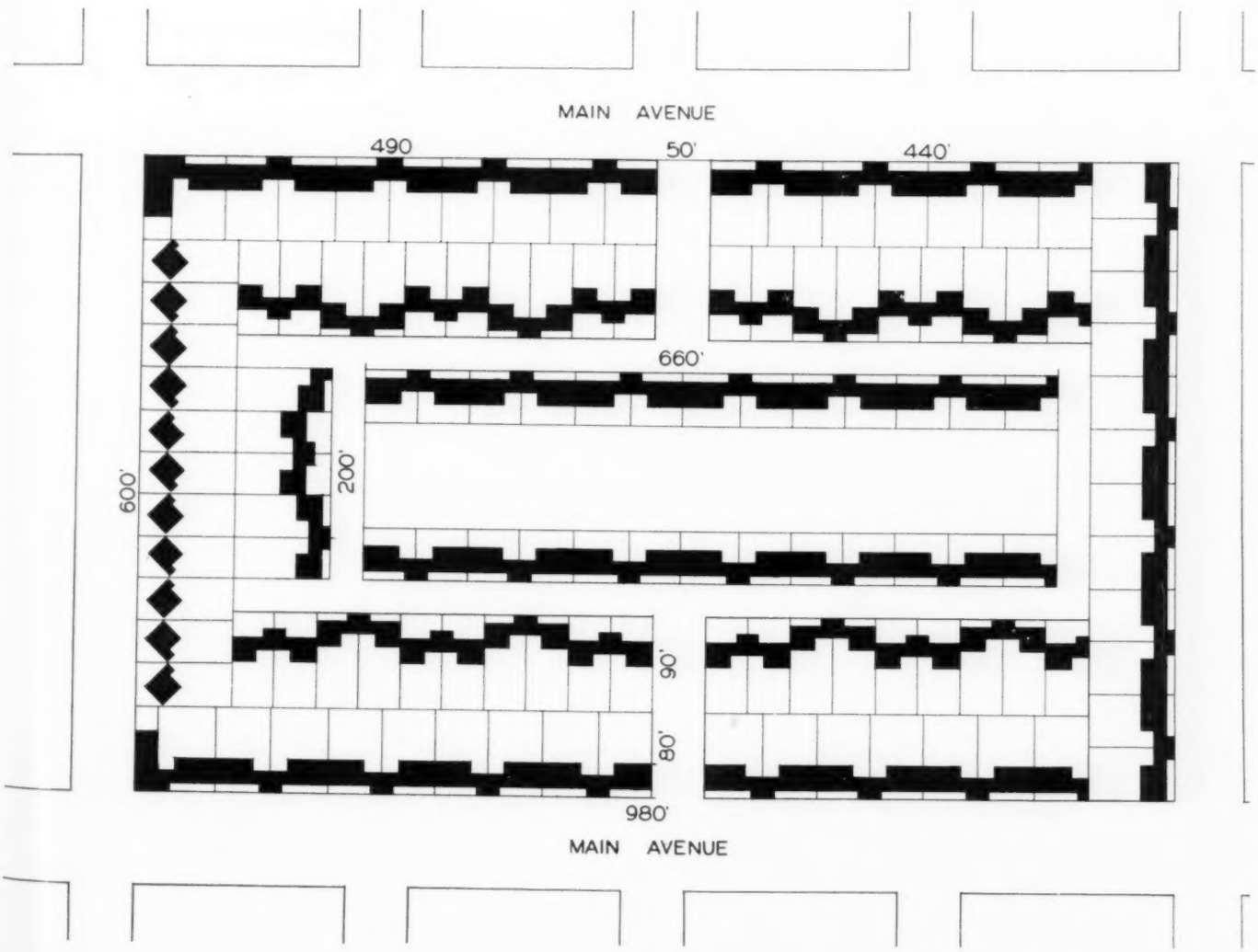
REPORT OF SUB-COMMITTEE ON SITE PLANNING AND GROUPING

(CONSISTING OF COMPETITION PRIZE - WINNERS AND HENRY WRIGHT)

"The small house field can be reached and improved only to a limited extent, if our efforts are confined merely to the reduction of the cost of plans and the improvement of design. This field will continue to be served mainly by the mass builder who has obvious advantages for economies and methods of large scale financing. His failure in the past to produce a more creditable output has been because of his limitations in planning ability. It is therefore believed that one of the most important opportunities for the architectural profession lies in making studies and suggesting the possibilities of better community organization open to the mass producer. We have therefore made studies individually and collectively of such better grouping, utilizing the plans which were submitted in the competition and have been able to realize the following results:

"It is considered desirable to include with even such inexpensive houses more land than is customarily offered by the large builder. A 50-foot lot of from 5,000 to 6,500 square feet, depending on depth, is somewhat over-generous and out of proportion to the proposed house cost, however. Lots with completely developed improvements will average not less than $30 a foot with the normal street plan and without speculative profit, though lower costs may at times be available. A 50-foot lot is essential to a good standard of spacing on the basis of a uniform setback. We have, however, suggested certain simple departures from such setback which would add to the appearance of the neighborhood and reduce the average frontage to 40 feet or $1,200 for the lot with complete public and basic lot improvements.

(BELOW) A SITE PLAN BY J. ANDRE FOUILHOUX, SHOWING BLOCK GROUPING OF HOUSE DESIGNS AWARDED FIRST AND FOURTH PRIZES IN COMPETITION.



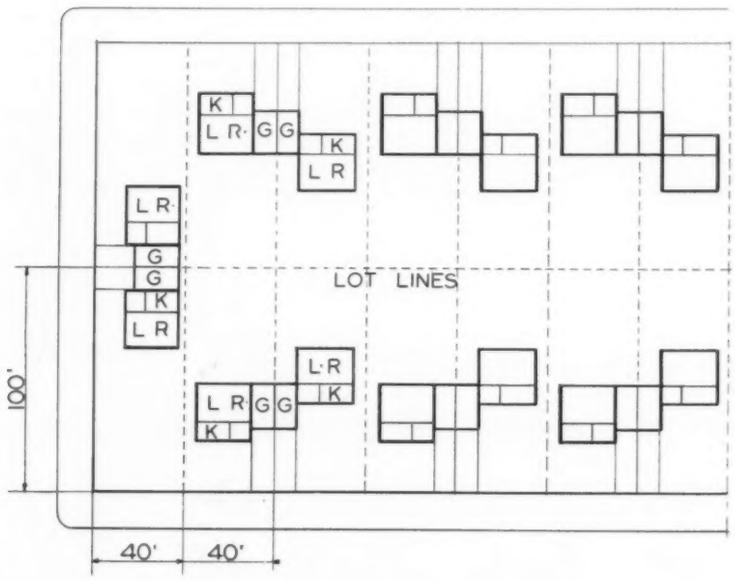
A further saving of perhaps $200 might be had through the use of narrow roadways and less expensive pavements in minor streets and cul-de-sacs.

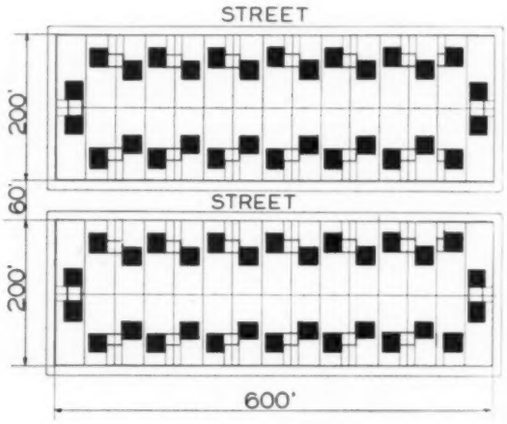
"By the simplest means the mass production of small houses can be relieved of monotony while preserving the inherent economies. A staggered frontage is possible in group building but not attainable through individual procedure. The private lane or cul-de-sac has further advantages in both economy and living quality but is less appropriate for a gradual building procedure than where it can be built up completely at one time.

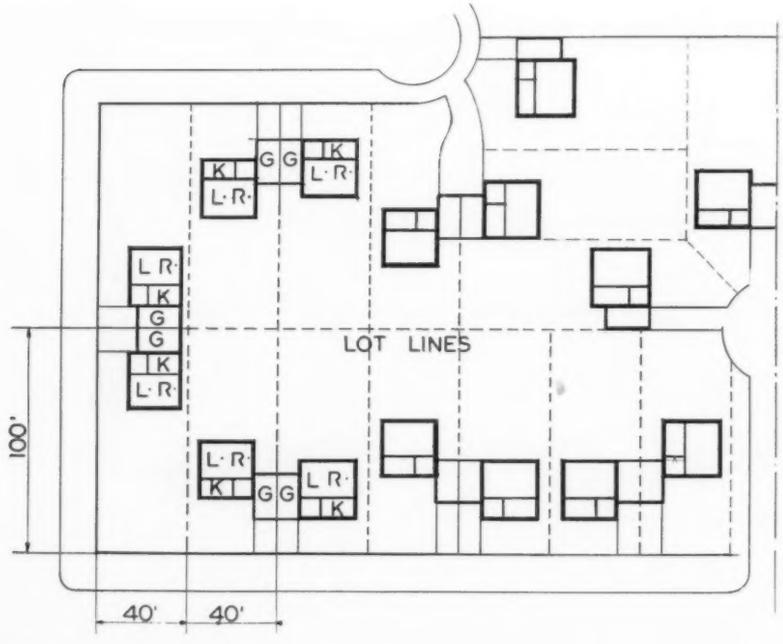
"Variety is obtained by grouping rather than by trite changes in a uniform elevation. A considerable degree of good orientation may be obtained by merely turning a simple plan. This also produces an effective group relationship. A better relation of garden to living area in the house is likewise obtained.

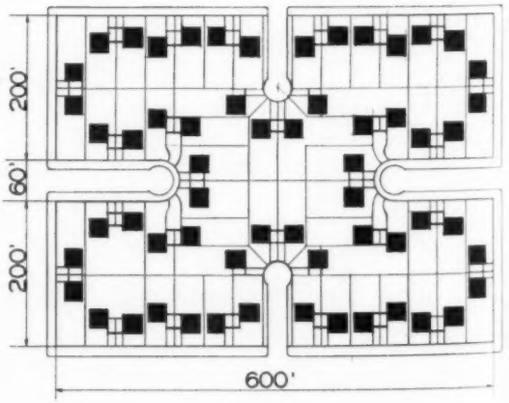
"More subtle and interesting effects can be secured where the plans are carefully worked out for the use of two or more standard base plans, with uniform kitchen, bath and stair features. The Committee has not as yet had time to try this more complex problem.

BELOW: SITE PLANS BY JOHN THEODORE HANEMAN, ARCHITECT, SHOWING GROUPING OF HOUSE DESIGN AWARDED SECOND PRIZE.





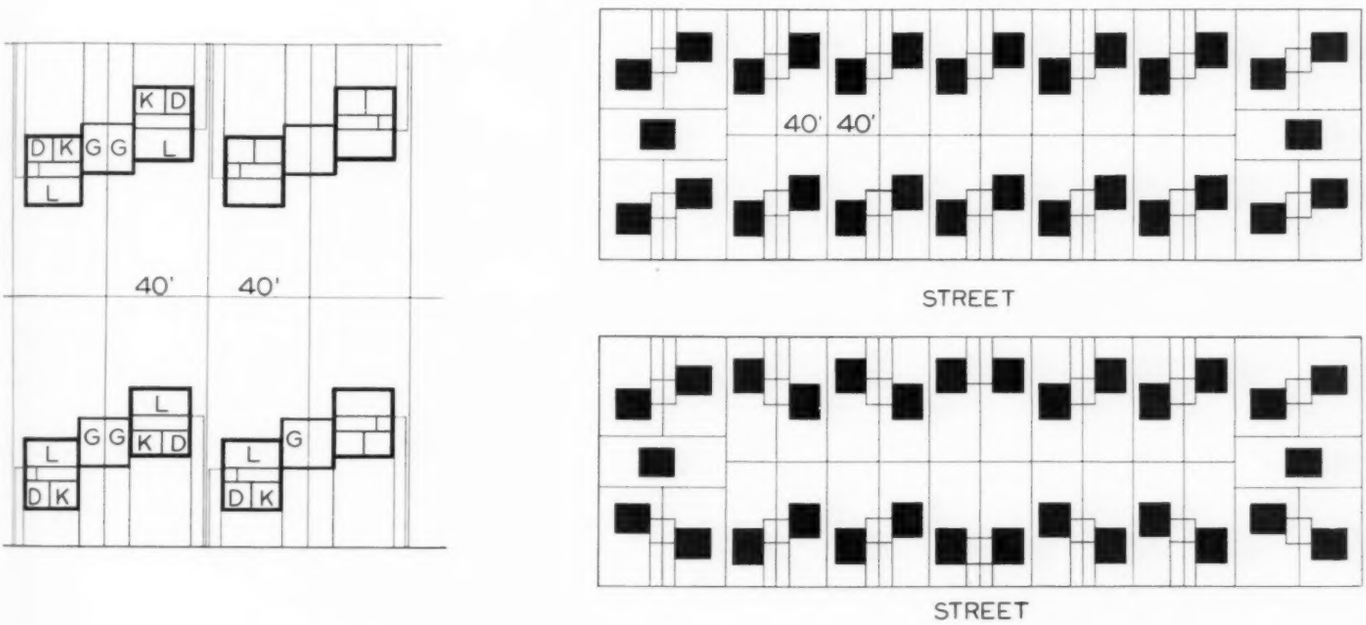


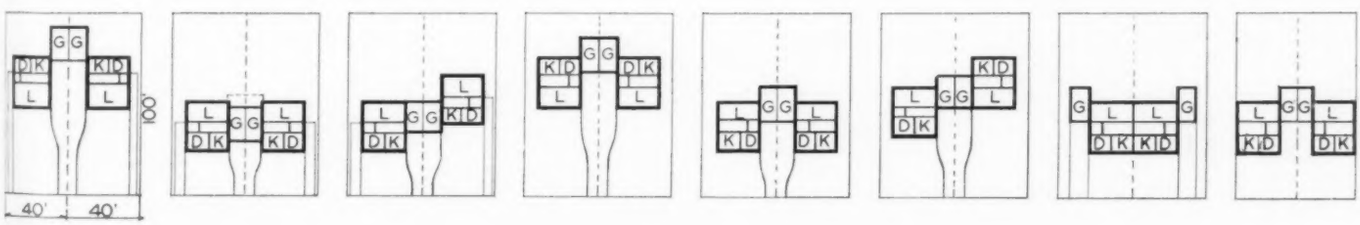


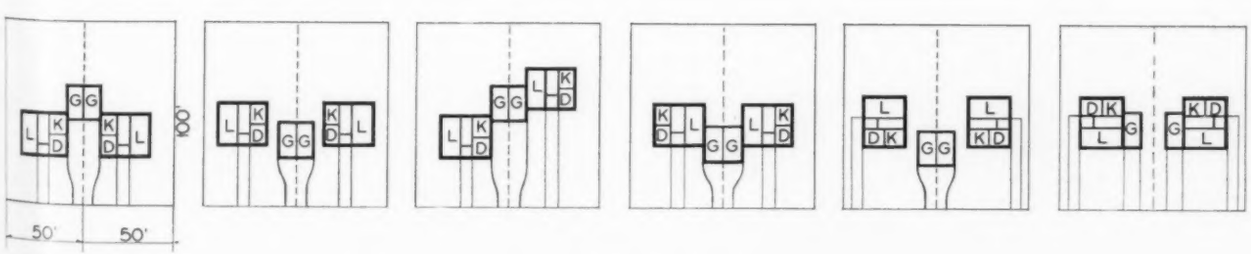
"In any event it is considered imperative that all such proposals be of a simple nature so as to be readily understood by the average type of builder and sales agency in this field. Lot lines should not become too complicated, and spaces requiring common maintenance should be avoided or left optional with the builder. On the other hand, builders must be convinced that they have a valuable selling advantage in featuring permanent qualities and livability in place of possible easy turnover and quick profit.

"The A. I. A. can aid morally as well as technically in leading the needed reforms in building laws and city planning so as to encourage such desirable departures from the ordinary cut-and-dried but extravagant processes of suburban land expansion and in curtailing some of the existing wastefulness by altering street patterns, and introducing safety and quiet into residential neighborhoods. At the outset such studies may very well be made jointly and sponsored by the A. I. A. As a better understanding is developed on the part of both the architect and the builder, the latter will naturally bring his problems to individual architects for solution."

BELOW: SITE PLANS BY FREDERICK G. FROST, SHOWING GROUPING OF HOUSE DESIGN AWARDED THIRD PRIZE.







STATE AND DISTRICT OFFICES OF THE FEDERAL HOUSING ADMINISTRATION

ALABAMA (6):
2105 Third Avenue North,
Birmingham.

ARIZONA (12):
704 Heard Building,
Phoenix.

ARKANSAS (8):
408 Donaghey Building,
Little Rock.

CALIFORNIA (12):
Northern District:
1722 Russ Building,
San Francisco.
Southern District:
Room 609, 756 South Spring Street,
Los Angeles.

COLORADO (10):
512 United States National Bank Bldg.,
Denver.

CONNECTICUT (2):
Room 301, 125 Trumbull Street,
Hartford.

DELAWARE (3):
518 Industrial Trust Building,
Tenth and Shipley Streets,
Wilmington.

FLORIDA (6):
1512 Lynch Building,
Jacksonville.

GEORGIA (6):
505 First National Bank Building,
Atlanta.

IDAHO (12):
401 Idaho Building,
Boise.

ILLINOIS (7):
Northern District:
Room 1800, 134 N. La Salle Street,
Chicago.
Southern District:
620 Illinois Building,
Springfield.

INDIANA (7):
809 Continental Building,
17 North Meridian Street,
Indianapolis.

IOWA (7):
418 Old Federal Building,
Des Moines.

KANSAS (10):
309 Federal Building,
Topeka.

KENTUCKY (8):
Martin Brown Building,
Louisville.

LOUISIANA (6):
1106 Hibernia Bank Building,
New Orleans.

MAINE (2):
477 Congress Street,
Portland.

MARYLAND (5):
919 Fidelity Building,
Baltimore.

MASSACHUSETTS (2):
Room 305, Park Square Building,
Boston.

MICHIGAN (4):
1174 First National Bank Building,
Detroit.

MINNESOTA (9):
200 Roanoke Building,
Minneapolis.

MISSISSIPPI (6):
211 Lamar Life Building,
Jackson.

MISSOURI (8):
710 R. A. Long Building,
Kansas City.
913 Ambassador Building,
St. Louis.

MONTANA (9):
United States Assay Building,
Helena.

NEBRASKA (10):
670 Saunders-Kennedy Building,
Omaha.

NEVADA (12):
Old Federal Building,
Reno.

NEW HAMPSHIRE (2):
9 Capitol Street,
Concord.

NEW JERSEY (3):
505 Industrial Office Building,
Newark.

NEW MEXICO (11):
301 Lensic Building,
Santa Fe.

NEW YORK (1):
Room 1280, 11 W. Forty-second Street,
New York City.
Room 305, 74 Chapel Street,
Albany.
728 Marine Trust Building,
Buffalo.

NORTH CAROLINA (5):
304 Haywood Bldg., 46 Haywood Street,
Asheville.

NORTH DAKOTA (9):
3 Eltinge Building,
Bismarck.

OHIO (4):
708 Hartman Building,
Columbus.
808 Bulkley Building,
Cleveland.

OKLAHOMA (11):
433 Key Building,
Oklahoma City.
822 Tulsa National Bank Building,
Tulsa.

OREGON (12):
420 Park Building,
Portland.

PENNSYLVANIA (3):
Western District:
934 New Federal Building,
Seventh Avenue and Grant Street,
Pittsburgh.
Eastern District:
1607 Fidelity-Philadelphia Trust Building,
Philadelphia.

RHODE ISLAND (2):
17 Exchange Place,
Providence.

SOUTH CAROLINA (5):
712 Peoples Office Building,
Charleston.

SOUTH DAKOTA (9):
Citizens Bank Building,
Sioux Falls.

TENNESSEE (8):
210 Federal Building,
Memphis.

TEXAS (11):
Northeastern District:
817 First National Bank Building,
Dallas.
Northwestern District:
9th Floor, First National Bank Building,
Fort Worth.
Southeastern District:
1627 Shell Building,
Houston.
Southwestern District:
19th Floor, Nilam Building,
San Antonio.

UTAH (10):
1109 First National Bank Building,
Salt Lake City.

VERMONT (2):
206 Bank Street,
Burlington.

VIRGINIA (5):
1430 Central National Bank Building,
Richmond.

WASHINGTON (12):
1813 Exchange Building,
Seattle.

WEST VIRGINIA (4):
405 Union Trust Building,
Parkersburg.

WISCONSIN (7):
18th Floor, Mariner Tower,
Milwaukee.

WYOMING (10):
Post Office Building,
Cheyenne.

DISTRICT OF COLUMBIA:
102 New Federal Housing Administration Building,
Vermont Avenue at K Street,
Washington.

ALASKA:
Juneau.

Note: Numerals in parentheses indicate region.

PORTFOLIO OF HOUSES

Photograph by R. Tebbs

HOUSE OF H. O. VOORHIS AT PLAINFIELD, NEW JERSEY—DESIGNED BY A. DEHART, ARCHITECT

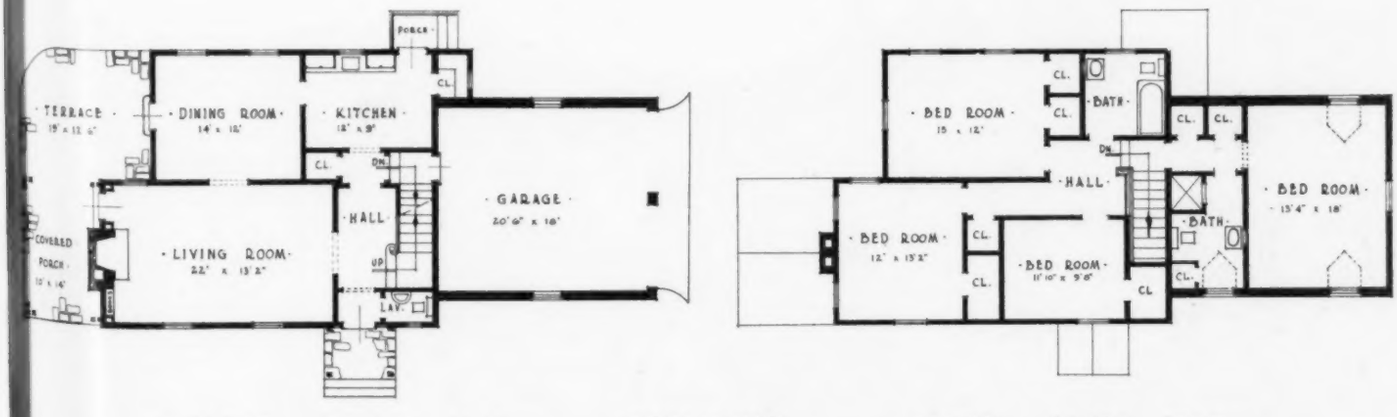
HOUSE OF H. O. VOORHIS
PLAINFIELD, NEW JERSEY
A. DEHART, ARCHITECT

Photographs by R. Tebbs

Photograph by Murray M. Peters

HOUSE OF FREDERIC H. RYDER AT ROCKVILLE CENTRE, NEW YORK

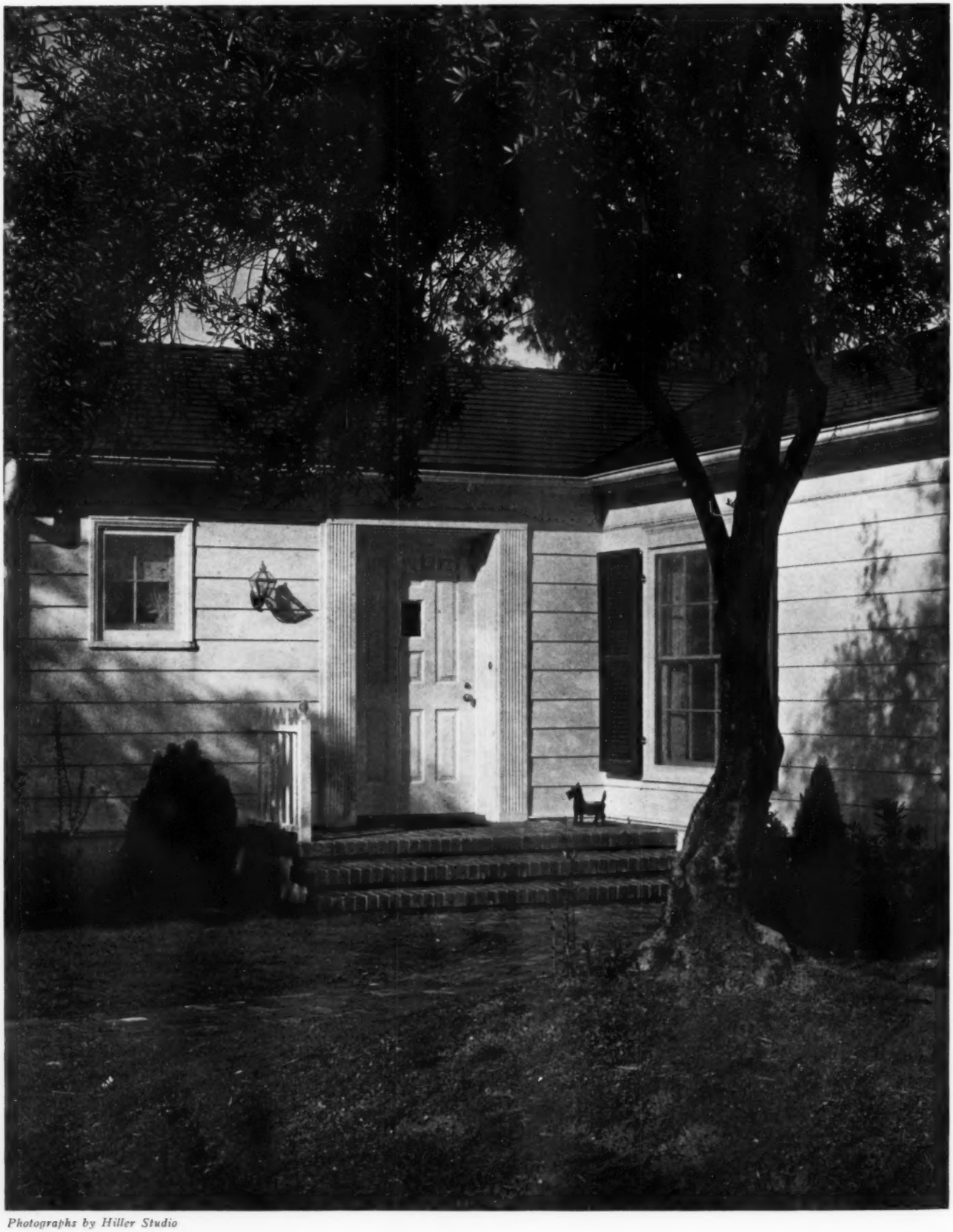
DESIGNED BY FRANK R. CREIGHTON, ARCHITECT



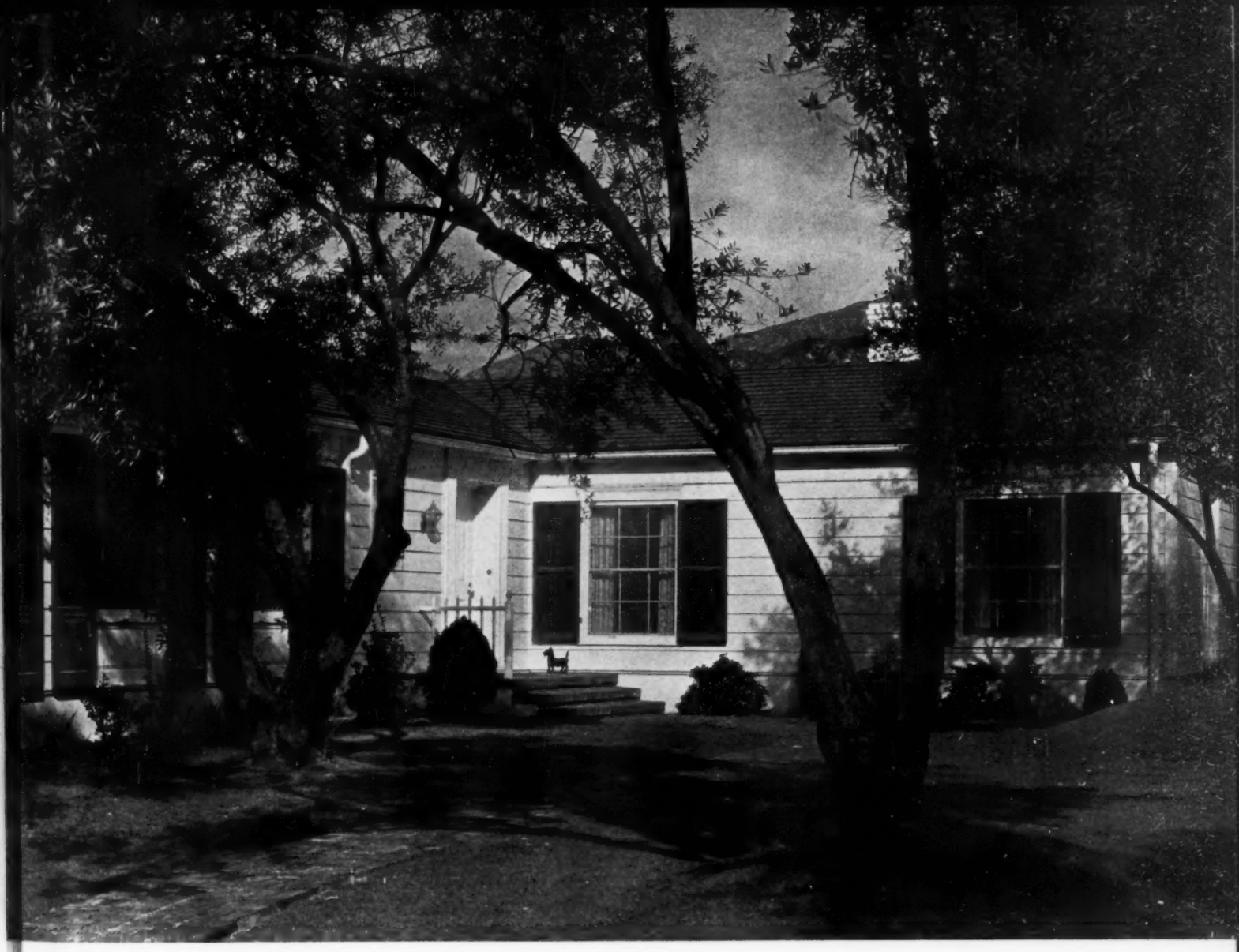
FIRST FLOOR PLAN — SECOND FLOOR PLAN

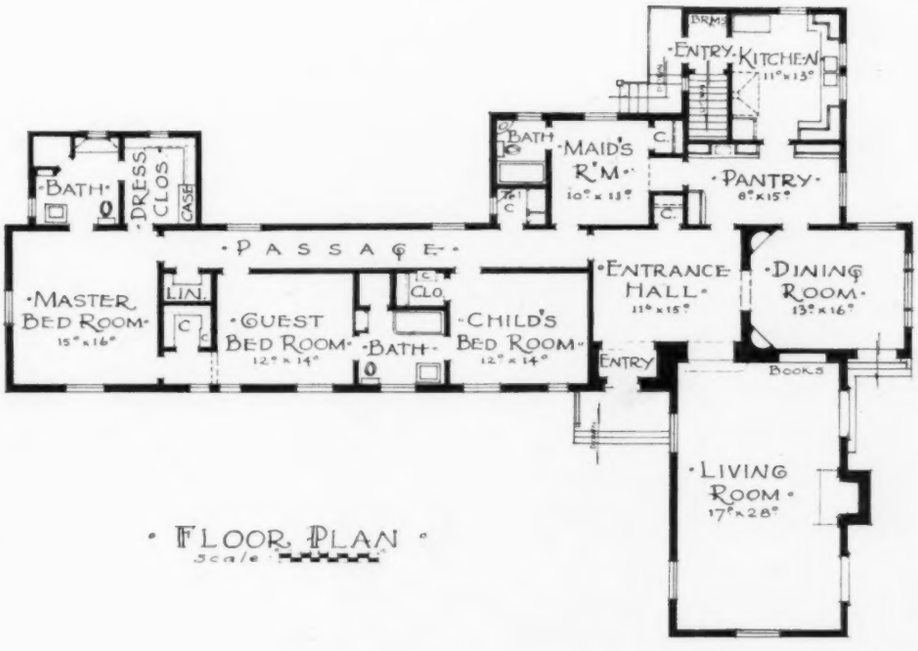
HOUSE OF ARNOLD R. WHITE AT ALTADENA, CALIFORNIA

MARSTON AND MAYBURY, ARCHITECTS



Photographs by Hiller Studio





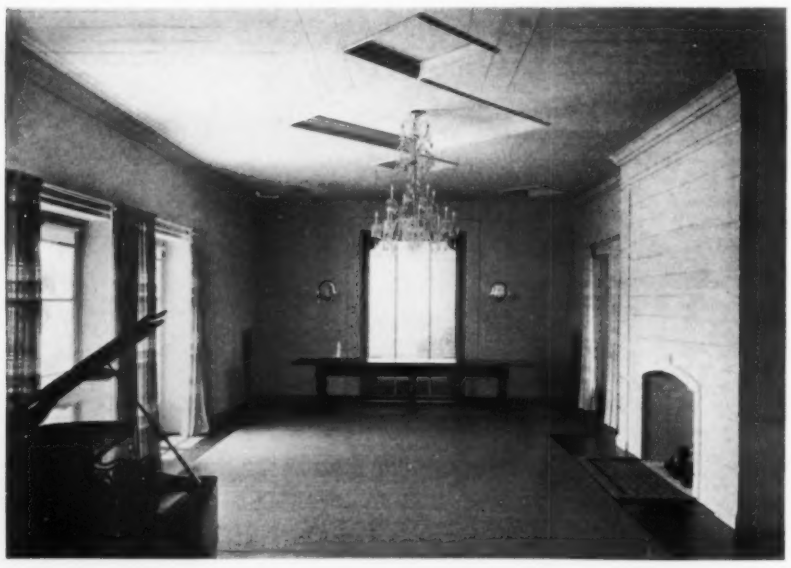
FLOOR PLAN

Scale

Photographs by Roger Sturtevant

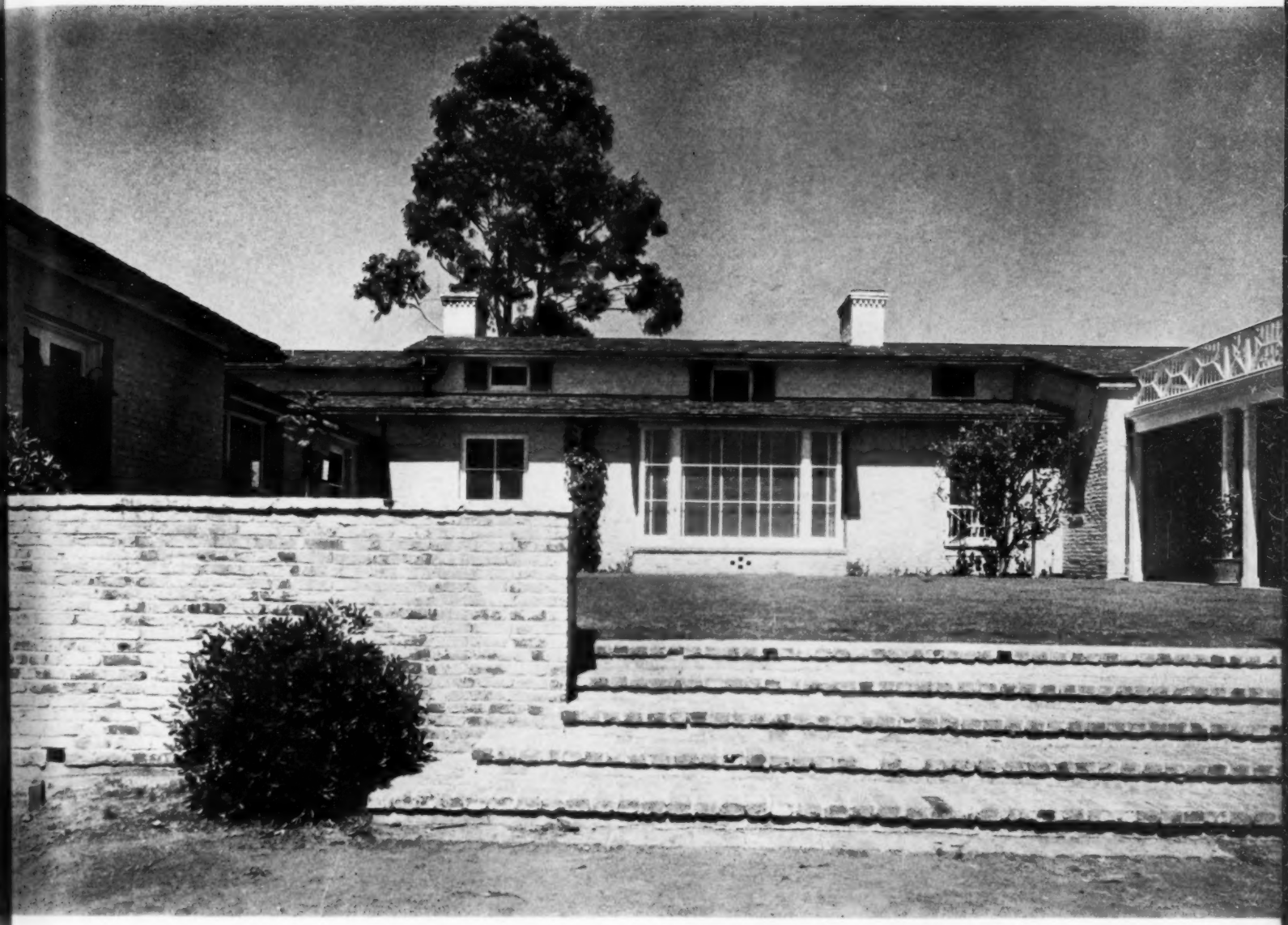
HOUSE OF W. N. CUMMING NEAR WATSONVILLE, CALIFORNIA

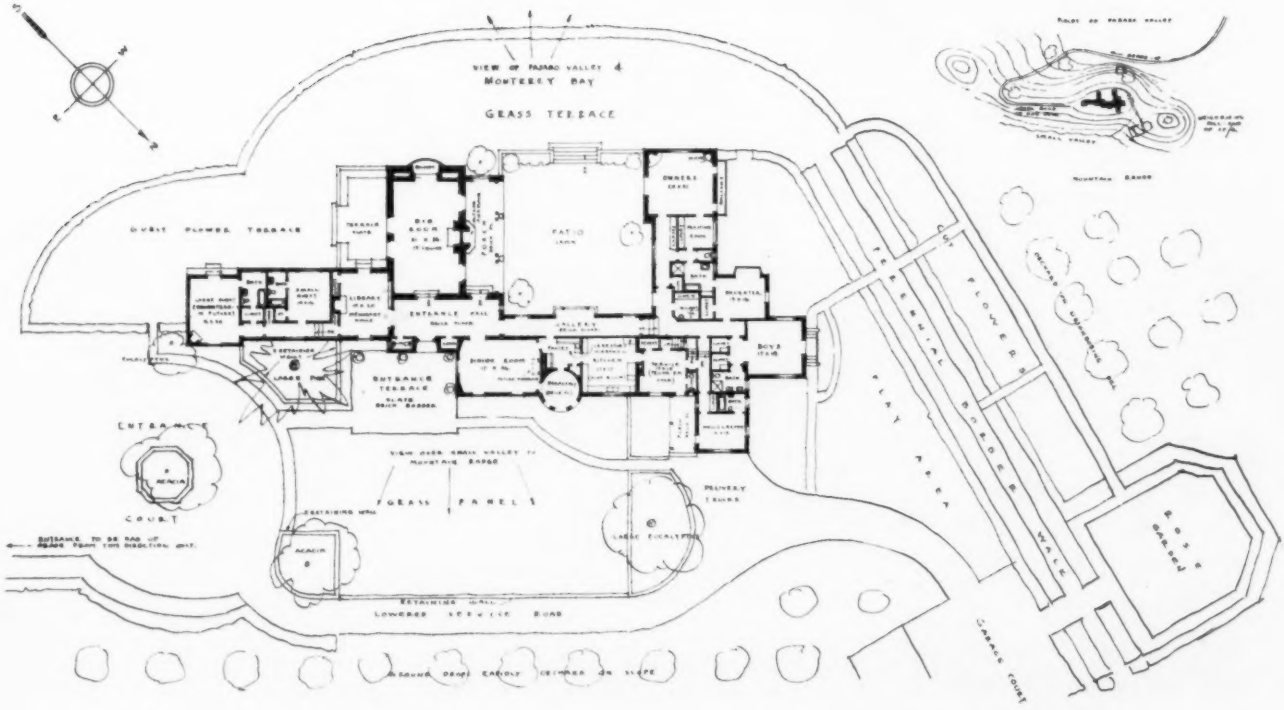
WILLIAM WILSON WURSTER, ARCHITECT



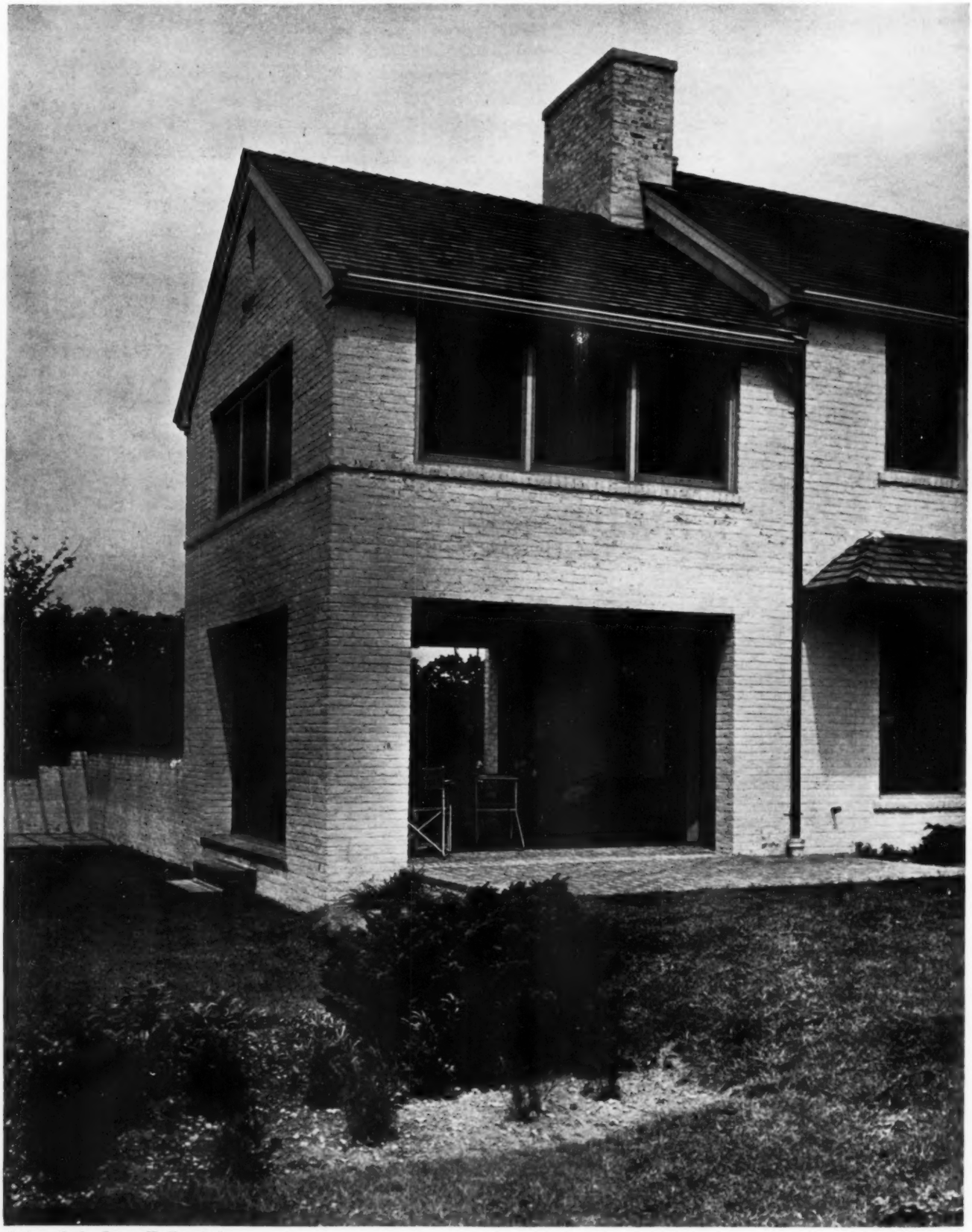
THOMAS D. CHURCH
LANDSCAPE ARCHITECT

ARMSTRONG, CARTER & KENYON
INTERIOR DECORATORS




VIEW OF PEBBLE VALLEY & MONTEREY BAY
GRASS TERRACE
OWNER'S
PATIO
ENTRANCE HALL
DINING ROOM
BOY'S
ENTRANCE TERRACE
ENTRANCE
COURT
GRASS PANEL
PLANTING TERRACE
PERENNIAL FLOWER BORDER WALL
PLAY AREA
ROSE GARDEN
GARAGE COURT
LOWERED SERVICE ROAD

HOUSE OF H. LOCKWOOD DE FOREST AT COLD SPRING HARBOR, LONG ISLAND
W. STUART THOMPSON, ARCHITECT

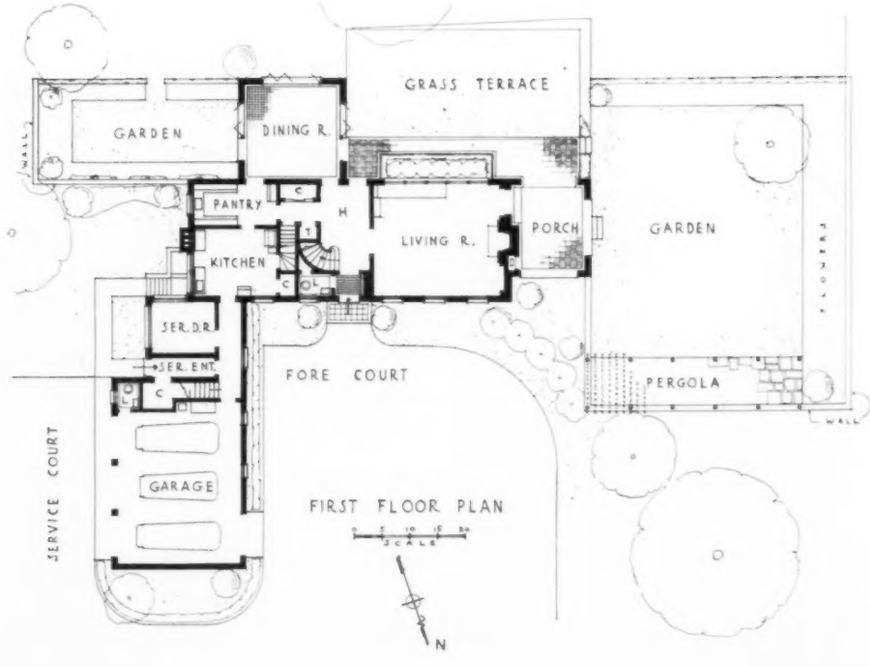


Photographs by George H. Van Anda

The house was built in a treeless meadow. The large trees were all transplanted, and the garden and landscape work designed with the house.

The exterior of building is common brick, painted white. The roof is shingle, stained gray. Exterior trim is white with olive green doors and windows. All floors of living rooms and halls and bedrooms are oak; dining room, tile; baths and lavatories, rubber tile; pantry and kitchen, linoleum. Walls have color integral in plaster; smooth float finish. Walls of dining room are brick, painted soft blue with white trim. Bathrooms are finished with waterproof paper and paint. Living room has oak trim and oak built-in desk, bookshelves and window seat. The facing and hearth are Kasota stone. The house is equipped with modern plumbing with brass pipe. A gas fired air-conditioned system has been installed. Cost of house (1933) was 34½¢ a cubic foot.

Photographs by George H. Van Anda

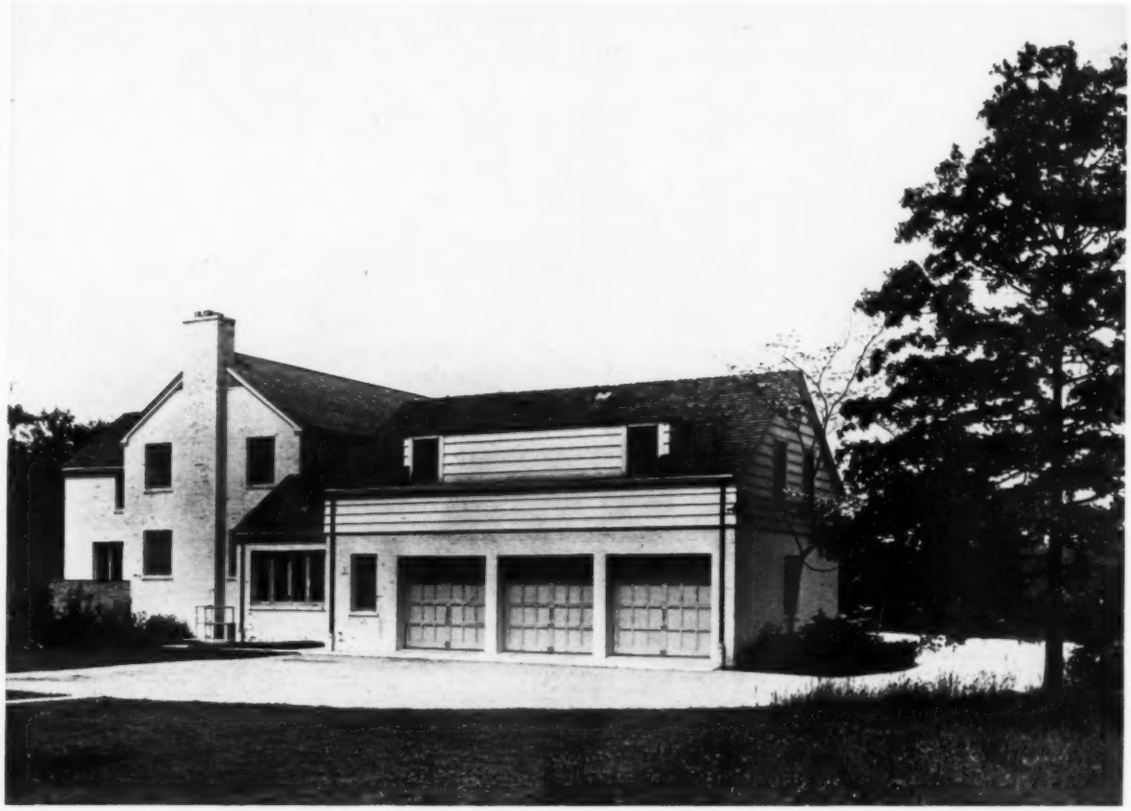


INTERIOR VIEWS OF THE DINING ROOM

SECOND FLOOR PLAN

W. STUART THOMPSON, ARCHITECT

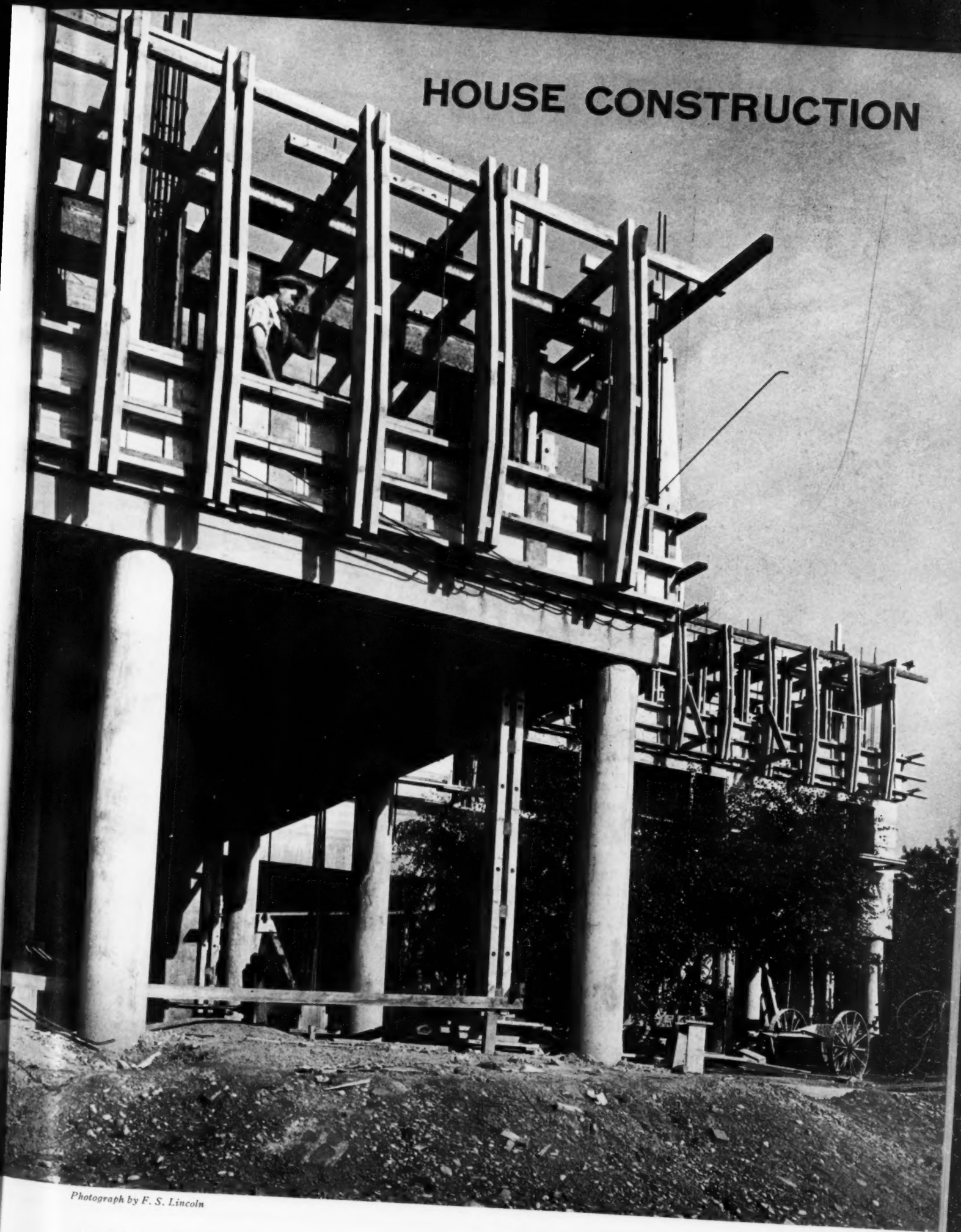
HOUSE OF H. LOCKWOOD DE FOREST AT COLD SPRING HARBOR, LONG ISLAND



HOUSE OF H. LOCKWOOD DE FOREST AT COLD SPRING HARBOR, L. I.
W. STUART THOMPSON, ARCHITECT

Photographs by George H. Van Anda

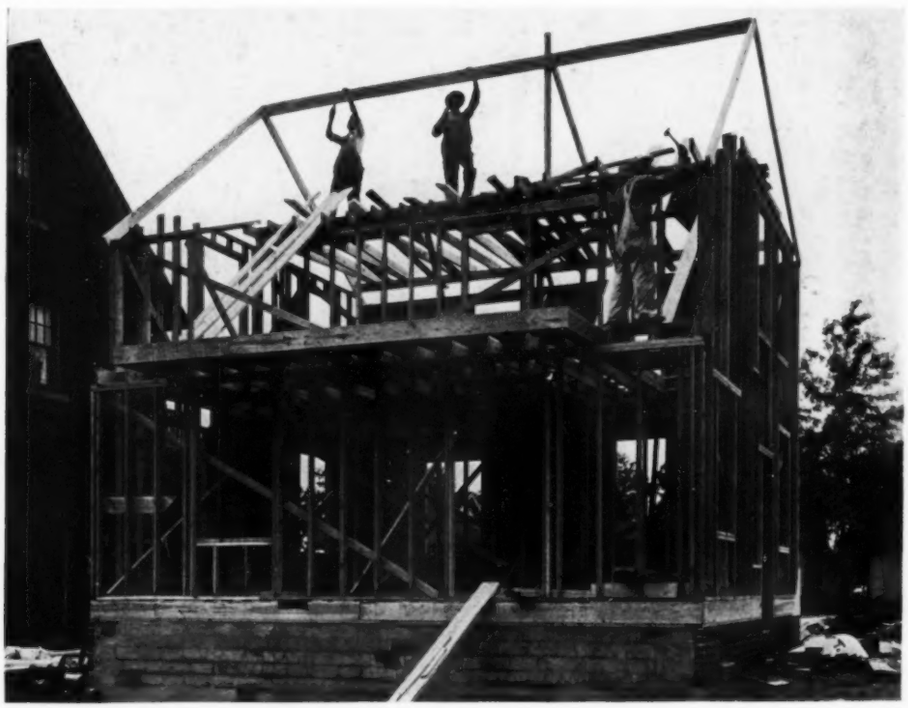
HOUSE CONSTRUCTION



Photograph by F. S. Lincoln

CONCRETE HOUSES AT GENESTA ROAD, PLUMSTEAD, ENGLAND—PILICHOWSKI AND LUBETKIN, ARCHITECTS

A house being built at Euclid, Ohio, by the Euclid Housing Corporation with the aid of a PWA loan.



TRADITIONAL CONSTRUCTION

PREFABRICATION WITH WOOD

The full scale model house built at the Forest Products Laboratory is indicative of the completely new rôle which wood will play when it finally submits to industrialization.

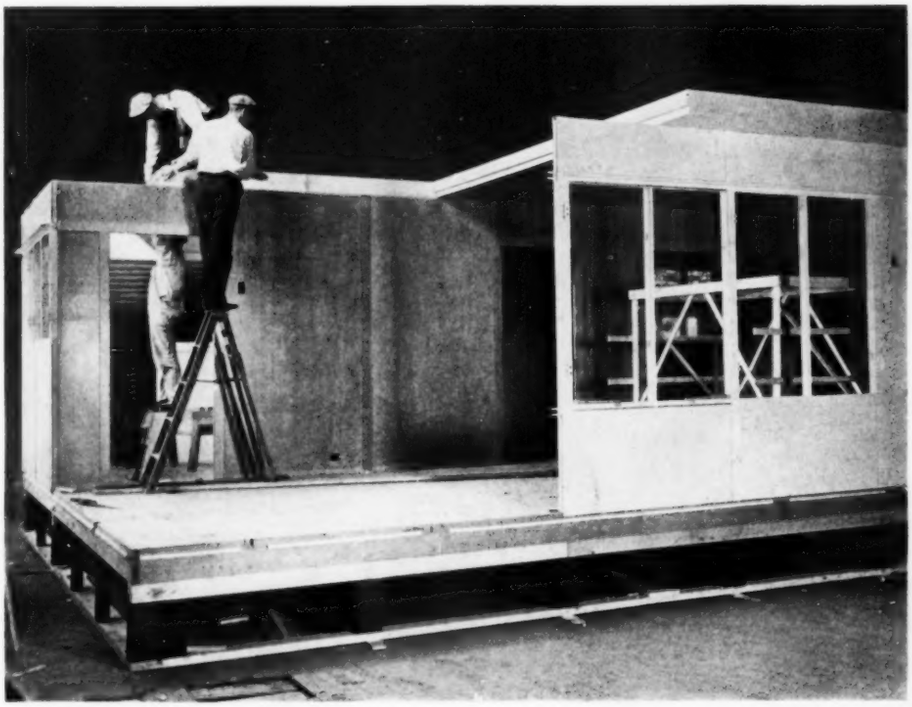
The structural system embodied in the demonstration house is an application of the "stressed covering" principle. Shortly after the World War the then current practice of covering the framework of airplane wings and fuselage with fabric was largely abandoned for a more efficient system in which the covering became an integral member which aided in resisting stresses, both bending and torsional. More effective performance and the elimination of much dead weight have made this system universal aircraft practice today.

Tests made at the Forest Products Laboratory on various methods of sheathing wood structures produced some very interesting data. It was discovered that the resistance of a frame wall to a static load applied in the plane of the wall when sheathed with ¼" plywood well nailed to the studs is about the same as when diagonal 1" sheathing is used. When ¼" plywood is glued to the studs, rigidity far in excess of any ordinary requirement is produced.

In the latter case, the construction lacks only a second sheet of plywood glued to the opposite face of the studs to produce a stressed-covering condition in which the faces of the panel act as the flanges of a box girder. So promising structurally was the stressed-covering idea that tests were undertaken to determine the design factors and predictable performance of panels built on that principle.

The specimens actually built and tested for this purpose were a series of floor panels with glued upper and lower faces of plywood, and results clearly demonstrated the high efficiency of the construction. It was found that in such a panel having a span of 13½ feet, a joist 5⅜ inches in depth is the practical equivalent of the 10-inch joist required by conventional carpentry, so that a substantial reduction is gained in both cost of material and in bulk of the floor system. It was also discovered that the stiffness of all such panels could be calculated with reasonable accuracy by neglecting the plies of the coverings which run at right angles to the joists and using 5/6 of the modulus of elasticity for the species of which the plywood is made, due account being taken of moisture content values.

These tests added sufficient engineering data to warrant application of the system to a specific method of prefabrication of wall, floor, and roof units of a house. And every indication seemed to point to prefabrication as the only reasonable basis for applying such a structural thesis. The new principle, promising high performance, economy of material, easy handling, and low transportation cost, could be realized in practice only through precision machine work, since sufficiently accurate dimensioning and gluing of the panels could



Prefabricated wood panels being assembled in model house built by Forest Products Laboratory.

NEW WOOD CONSTRUCTION

BY GEORGE W. TRAYER AND HAMILTON BEATTY

Forest Products Laboratory*, Forest Service U. S. Department of Agriculture

not be expected under the diverse and sundry conditions encountered on the typical contract job.

Actual design of wall, floor, and roof panels was a matter of calculation based on the data which the tests provided and the acceptance of a module of 4 feet, chosen because it represented the width of commercially available plywood. The model house was planned with no spans in excess of 13' 6"; hence the depth of the structural members in floor and roof panels was kept down to 5⅜", with top coverings of ⅝" plywood and lower coverings of ⅜" plywood. Contiguous edges of adjacent floor and roof panels were splined to distribute concentrated loads.

Using this panel system the Laboratory designed its demonstration house with a floor space of 21 by 29 feet. Into that area were built four rooms, including kitchen, living room, two bedrooms, a bath and a utility room.

A standard wall panel consists of two sheets of ¼" plywood, each 4 feet wide and 8 feet long, which are glued to a central framework of light structural members. The thickness of wall panel framing was arbitrarily set at 1⅜" because it corresponded with the thickness of cheap stock doors.

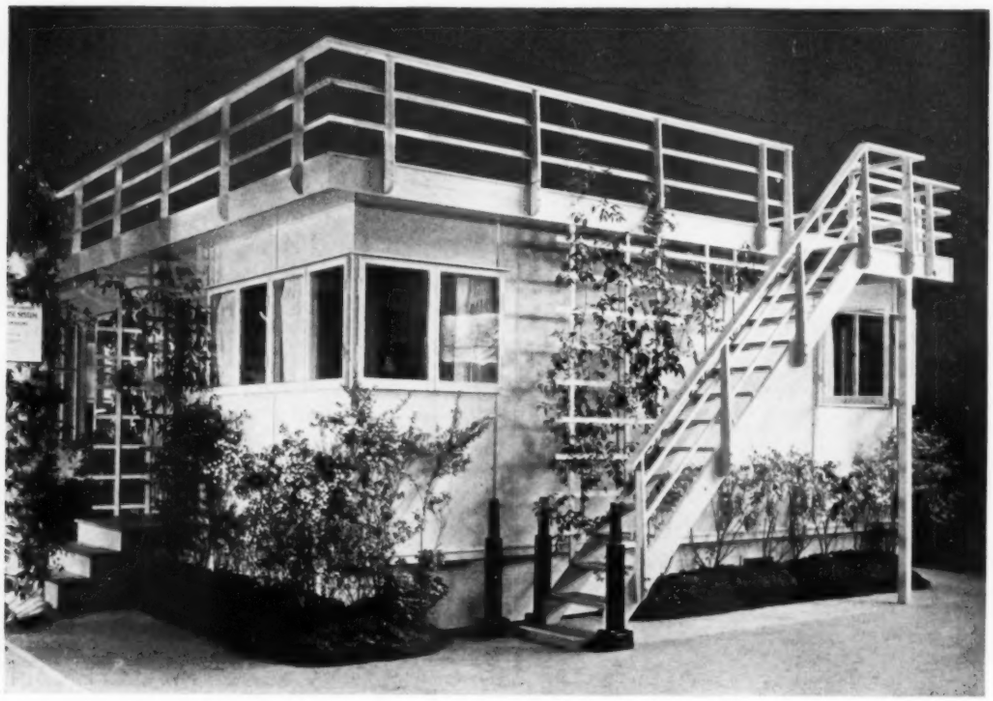
Joining the wall panels together was a problem, since both structural and protection considerations had to be faced. Its solution was the use of a vertical mullion member grooved on its two edges to receive the plywood facings of the wall panels, which were allowed to project ¾" beyond the internal framework. Filling these grooves with a mastic before the adjacent wall panels are shoved home provides an excellent seal and assures protection to the most vulnerable points in the whole system. Modifications of the vertical mullion were designed for the corners, for the junction of partitions with outside walls, for window sills, and for door and window heads and jambs.

A vertical section of the house shows the unusual window treatment in which the sash are hung completely outside the plane of the wall. This overcame an exceedingly difficult weatherproofing problem created by the built-up sill members and the thinness of the walls. The aperture between the sash and exterior casing members was sealed with a spring bronze weather strip, the most efficient gasket that could be readily procured.

Electrical needs are provided by building the necessary wiring and outlets into the panels in the process of manufacture. In assembly, an encircling conduit placed beneath the water table of the house connects the panel network. Wiring in interior panels is handled in the same way and connects with a conduit running below the floor.

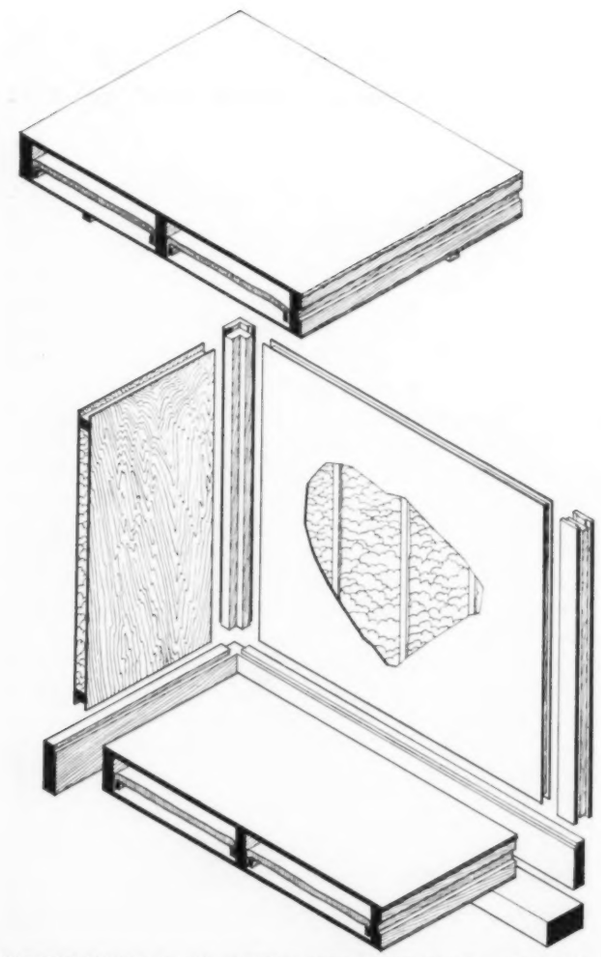
Plumbing for the demonstration house represents nothing more than an economical handling of current equipment achieved through careful planning of a

*Maintained at Madison, Wisconsin, in cooperation with the University of Wisconsin.



(Left) Complete house, as exhibited at Madison, Wisconsin, House Show, was erected in 21 hours by 7 men.

(Right) Small wood dowels are used to join window panels in walls, or at corners where one upright mullion serves as jamb for two windows. . . . Joining prefitted window panels: in a series of windows, only the first panel comes fitted with both upright mullions.



INTERLOCKING WALL, FLOOR AND ROOF PANEL ASSEMBLY

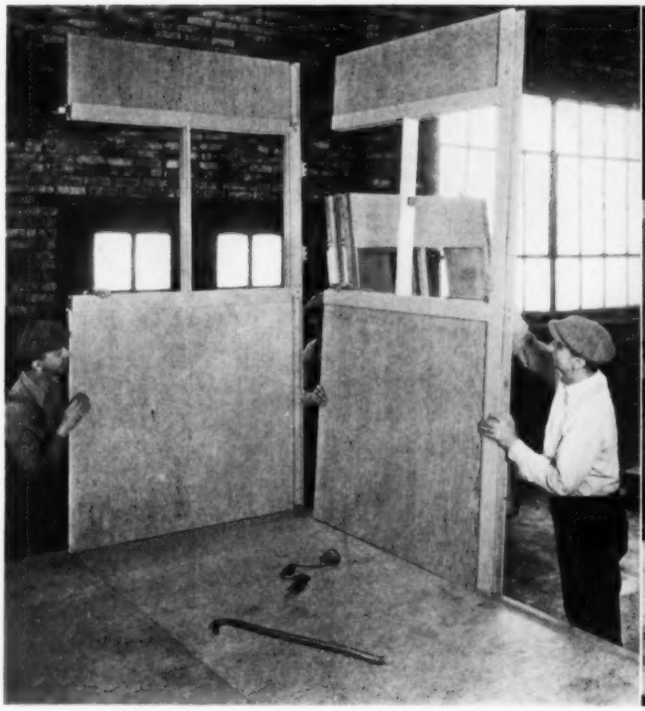
U. S. FOREST PRODUCTS LABORATORY

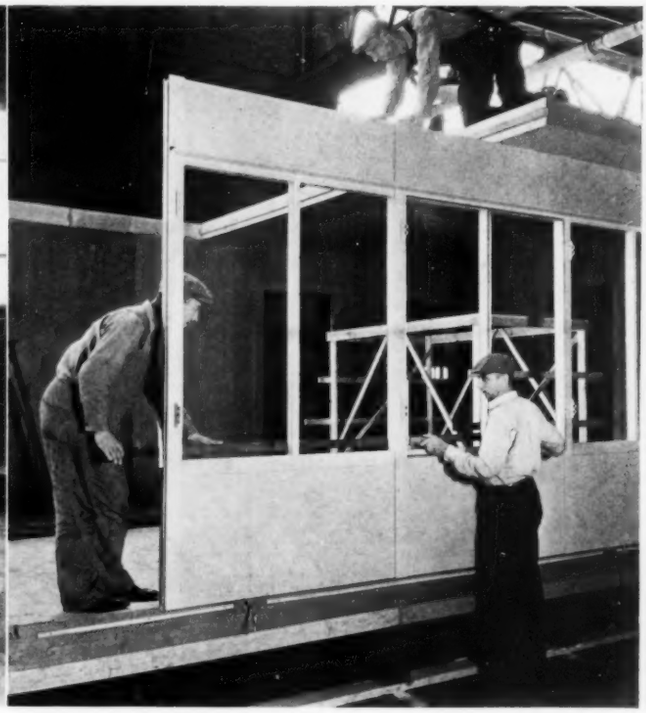
utility room which is adjoined by both bath and kitchen. Heating is provided by a hot-air circulator placed in the living room. In panels through which plumbing pipes and chimney had to pass, reinforcing blocks were placed at the critical points during fabrication.

Careful consideration of the roof led to the selection of the flat deck type as the only logical solution. Not only did the deck lend itself in simple fashion to the system of prefabrication, but it added logical validity to the whole model as a complete departure from its traditional but more costly forebears.

A built-up roofing sheet, unbroken except for chimney and central roof drain, was carried over a cant strip and low curb at the roof edge and sealed by a narrow wood strip nailed to the face board. A substantial wood railing permits safe use of the deck space by occupants. It is supported by posts lag-screwed to sides and ends of the roof panels, an attachment which avoids puncturing the roof membrane.

Even the finished flooring of the house is prefabricated. The small pieces which go to make it up are factory-produced, and assembled on 4-foot squares of plywood so that there is a $\frac{3}{8}$" projection of plywood on all sides. On the site the squares are laid in place and secured to the floor panels by means of T-shaped parting strips. White oak strips were used with both the red gum of the bedroom and the red oak of the living-room floors.



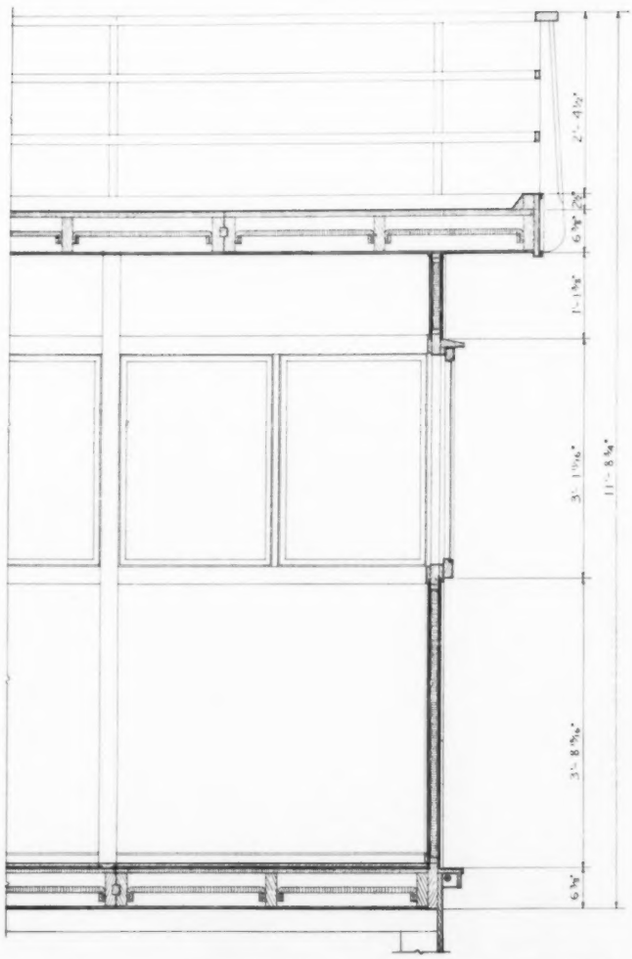


PREFABRICATED ALL-WOOD HOUSE

The bathroom floor represents a special development in wood utilization. Hardwood sawdust, chemically treated, is molded under pressure to form a dense, black, impervious plastic. Because only experimental equipment was available, the largest sheet of this plastic which could be made for this floor was a 4½" disc. The discs were machined into hexagons and squares to form the main body of the floor and its border. In production the whole floor with an integral cove base would undoubtedly be molded from this plastic in a single unit.

Since the success of this structural system must depend on the preservation of the plywood and the glue lines between plywood and structural framework, adequate weather protection is a prime requisite. The exterior finish, therefore, was chosen for its protective and lasting qualities. An aluminum priming coat was followed by a second coat of aluminum and a lead-and-oil undercoat. A lead-and-oil finish coat completed the four-coat process.

The bedroom interiors received one coat of shellac followed by a coat of wax. The living room was given a coat of shellac and then a warm russet glaze consisting of linseed oil, flat varnish, and pigment. Bathroom and kitchen walls and ceilings first received a prime coat of aluminum followed by a coat of enamel undercoat which was stippled to eliminate any suggestion of grain. Another undercoat was then applied before putting on the finish coat of enamel.

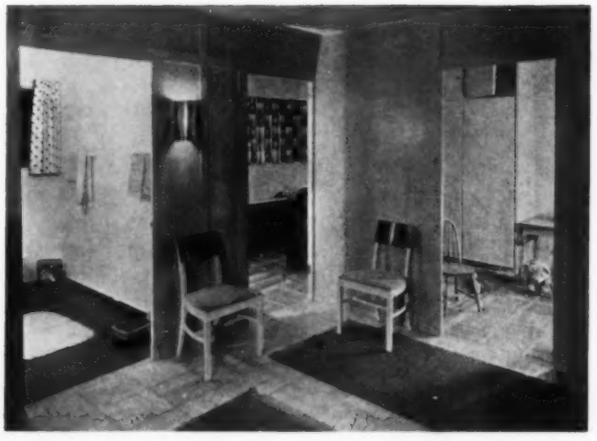


VERTICAL SECTION THROUGH TYPICAL WINDOW PANEL

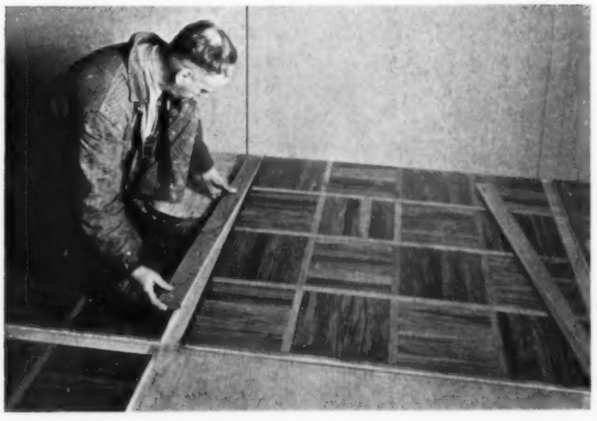
U. S. FOREST PRODUCTS LABORATORY PREFABRICATED ALL-WOOD HOUSE

FLOOR PLAN OF DEMONSTRATION HOUSE

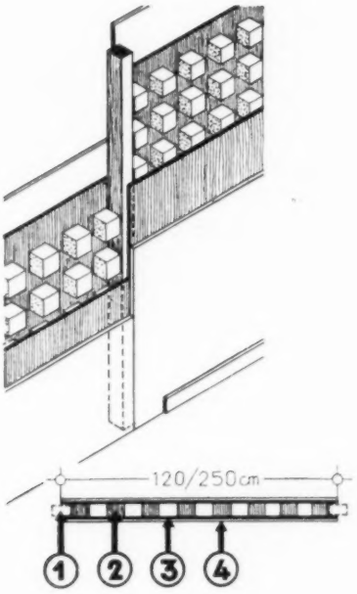
Interior of nursery, showing built-in cabinet.



View of living room, showing entrances to bathroom, master bedroom, and nursery.



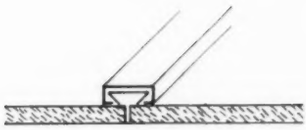
Laying the hardwood floor: T-shaped hardwood strips hold the prefabricated squares solidly to the panel subfloor.



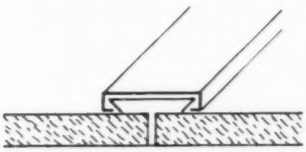
STANDARDIZED PREFABRICATED WALL UNIT

Made of sheets of plywood glued to square wood blocks. Width: 4 feet. Height: 8 to 10 feet. Qualities: light weight, structural rigidity, dry assembly, good thermal and sound insulation, concealed installation of pipe conduits and easy fastening of fixtures.

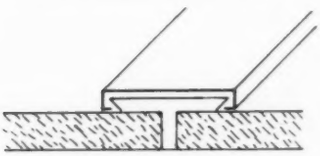
(1) STRUCTURAL FRAME.
(2) WOOD BLOCK SPACERS.
(3) PLYWOOD.
(4) INSULATION BOARD, VENEER OR CANVAS.



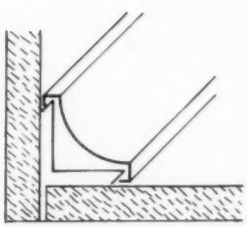
FLAT TOP
3/8" x 1/8"



FLAT TOP
3/4" x 1/8"



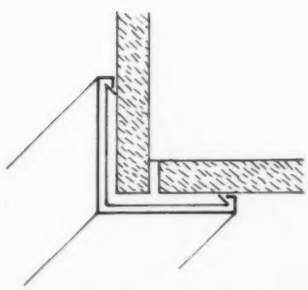
FLAT TOP
1" x 1/8"



INSIDE
CORNER
1/2" x 1/2"

SNAP - ON STAINLESS STEEL MOULDINGS

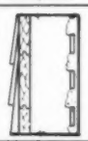
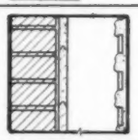
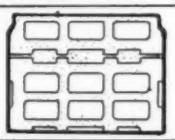
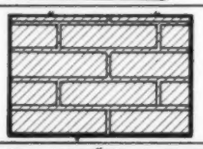
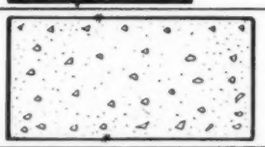
Joint cover strips for plywood, insulation board, flexboard, masonite, and similar products. No visible nails or screws. A dove-tail shaped track is nailed or screwed on first and then the cover strip is snapped into place. Mouldings may be had in bright or satin finish. Curved or other special shapes are also obtainable.



OUTSIDE
CORNER
3/4" x 3/4"

COMPARISON OF VARIOUS WALL CONSTRUCTIONS

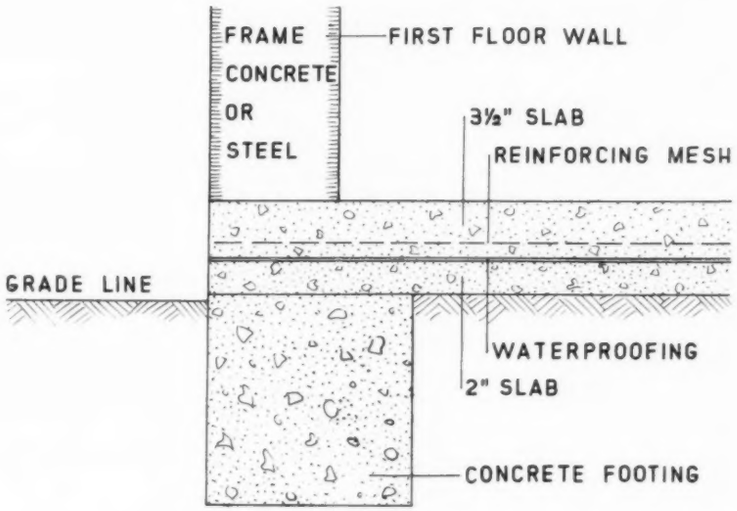
SHOWING OVERALL HEAT TRANSMISSION VALUES

TYPE OF WALL CONSTRUCTION	VERTICAL SECTION THRU WALL	WALL THICKNESS IN INCHES	OVERALL CONDUCTANCE IN B.T.U's.	WEIGHT IN LBS. PER SQ. FOOT THICKNESS AS NOTED
TRUSCON FERROCLAD INSULATION		1	.250	3.5
WOOD SHEATHING BOTH SIDES OF STUDS		5½	.288	7.0
PLASTER AND WOOD LATH BOTH SIDES OF STUDS		5½	.344	10.0
WOOD SIDING, WOOD SHEATHING LATH AND PLASTER STUD CONSTR		6	.262	11.0
BRICK VENEER, WOOD SHEATHING LATH AND PLASTER STUD CONSTR.		10	.247	50.0
HOLLOW TILE		12	.250	125.0
BRICK		15	.250	165.0
CONCRETE		25	.250	285.0
STONE		30	.250	330.0

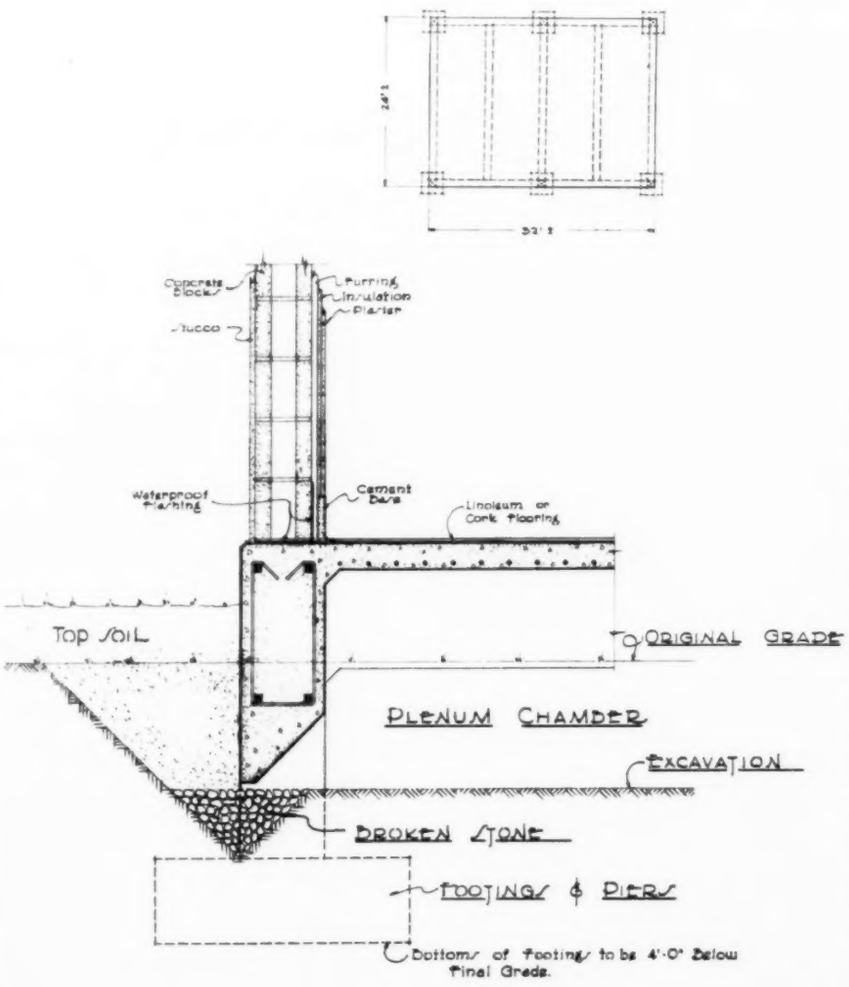
Conductivity values from A.S.H.V.E. Guide. Weights per square foot computed from established densities. Conductivity is the measure of heat flow—B.t.u. per hour per square foot per degree Fahrenheit. Chart by Truscon Steel Company.

FOUNDATIONS

Concrete footing and floor slab detail. Location in South or on West Coast where frost does not penetrate ground location. The earth on which slab is laid should be thoroughly tamped and wetted. Provision is made for waterproofing the floor slab. The top slab is reinforced with steel mesh. Bolts are set in top slab at time of pouring the 3½" concrete surface slab. These bolts are used to attach the frame of the house.



METHOD OF WATERPROOFING FIRST FLOOR CONCRETE SLAB



Concrete foundation, designed by Arthur J. Barzaghi, civil engineer, for a house in location where frost conditions require deep footings. There are six piers supporting the floor slab and six reinforced beams encircling the house. Three intermediate beams support the slab. Broken stone provides drainage beneath the outside beams. The wall indicated is of concrete blocks, stuccoed on the outside and furred, insulated and plastered on the inside. This house wall can also be of poured or precast concrete, tile, brick, steel or wood.

CONCRETE HOUSE CONSTRUCTION

A large number of concrete house construction systems have been developed during the past few years. A report of a survey by the Portland Cement Association in which many systems are illustrated and described is now available to architects. Copies can be obtained at 30 cents each from the Association's offices in Chicago (33 West Grand Avenue).

The following conclusions were reached by this survey:

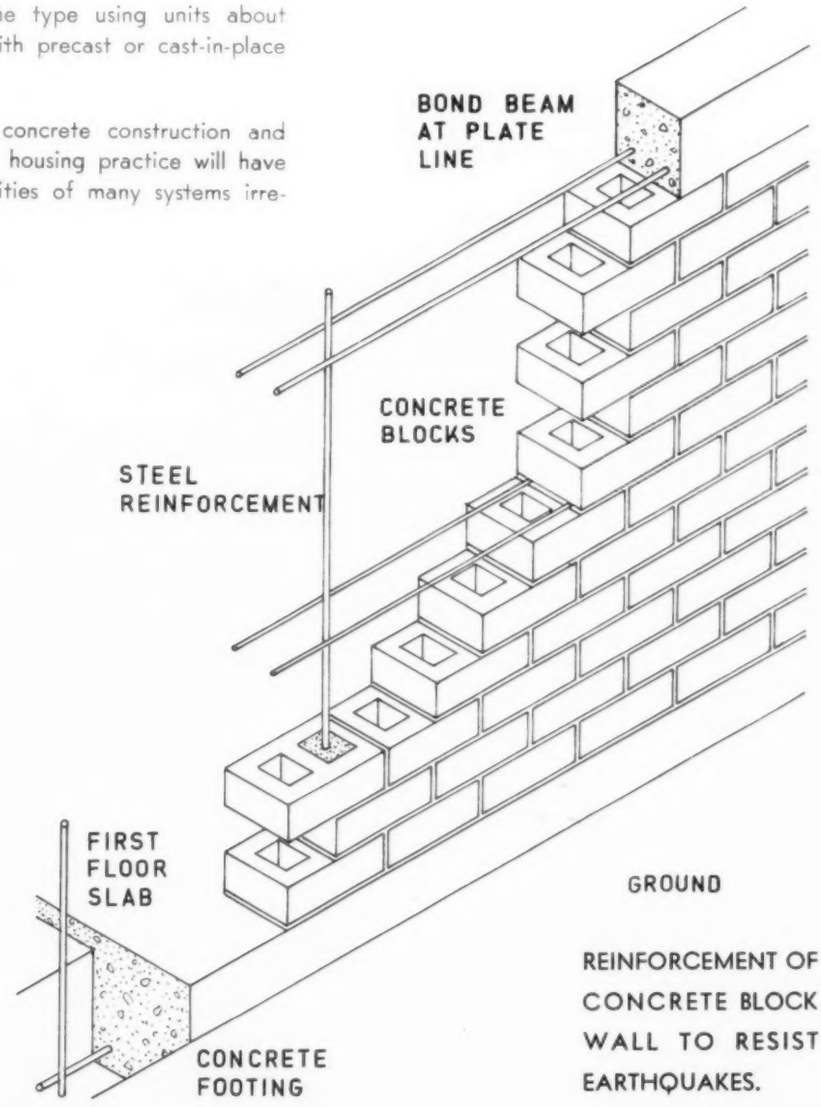
"Monolithic concrete probably represents the ultimate in permanent dwelling construction.

"The precast unit and stucco-structural frame methods are regarded as being well suited for home building and capable of further development.

"There is need for greater simplicity in the design and erection of forms for monolithic walls.

"Of the precast unit wall systems, the type using units about 12" high by 36" long in conjunction with precast or cast-in-place studs appears most promising.

"The important technical progress in concrete construction and equipment and the possible changes in housing practice will have considerable influence on the potentialities of many systems irrespective of their past experience."



REINFORCEMENT OF CONCRETE BLOCK WALL TO RESIST EARTHQUAKES.

A precast panel being put into place on the building site.

Reni Photographers

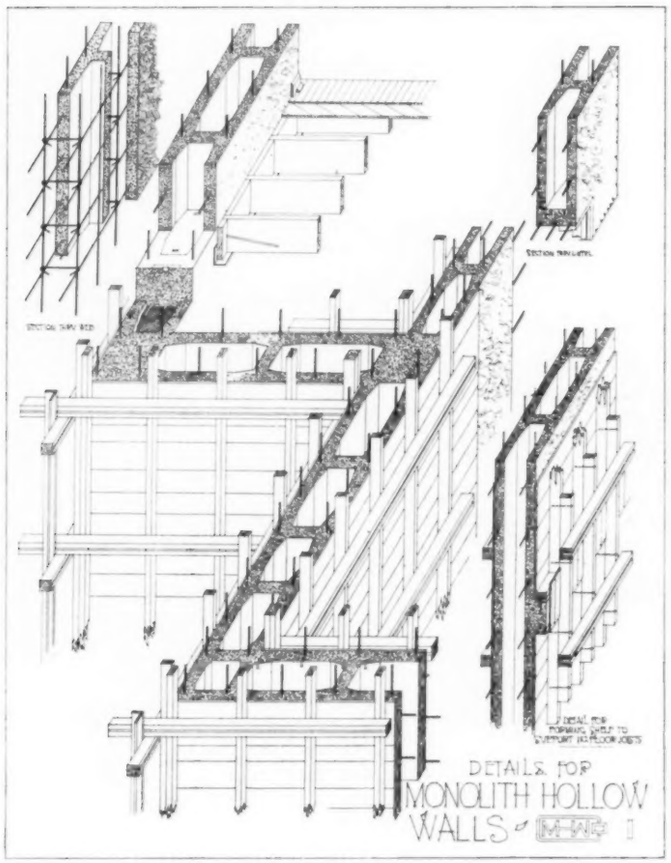
EARLEY PROCESS PRECAST MOSAIC CONCRETE PANELS

DEVELOPED BY EARLEY PROCESS CORP., WASHINGTON, D. C.

Jordan Syndicate

Mosaic concrete is made of crushed quartz, quartz sand and portland cement by a patented process. The aggregates are selected for their hardness and for their fadeless color. The "sand" used in making mosaic concrete is crushed from the same stone and graded to size as exactly as the larger aggregates. The concrete is cast in moulds from which it takes its form. Color and texture are determined by the color and the size of the aggregates. The moulds are removed just before the final hardening of the concrete. The surface cement is then wire-brushed and the panel washed with a weak solution of muriatic acid to produce a surface of "exposed aggregates."

The panels are 2 inches thick, approximately 9 feet high, from 4 to 10 feet wide and heavily reinforced with electrically welded steel mesh. They are cured for fourteen days in a humidity chamber until they have a crushing strength of about 5,000 pounds to the square inch. The panels are so made that they can be easily assembled upon a concrete foundation on which a skeleton of studding—wood or steel—is set. Light reinforced concrete columns are then cast behind the joints between the panels. The latter are attached to these columns by a process which combines them but leaves them free to move with the expansion and contraction of the concrete. The window casements are cast solidly into the panels themselves in the course of their prefabrication in the studio. The assembled walls completely enclose the building, thus enabling workers to proceed with the interior finish independent of external weather conditions.



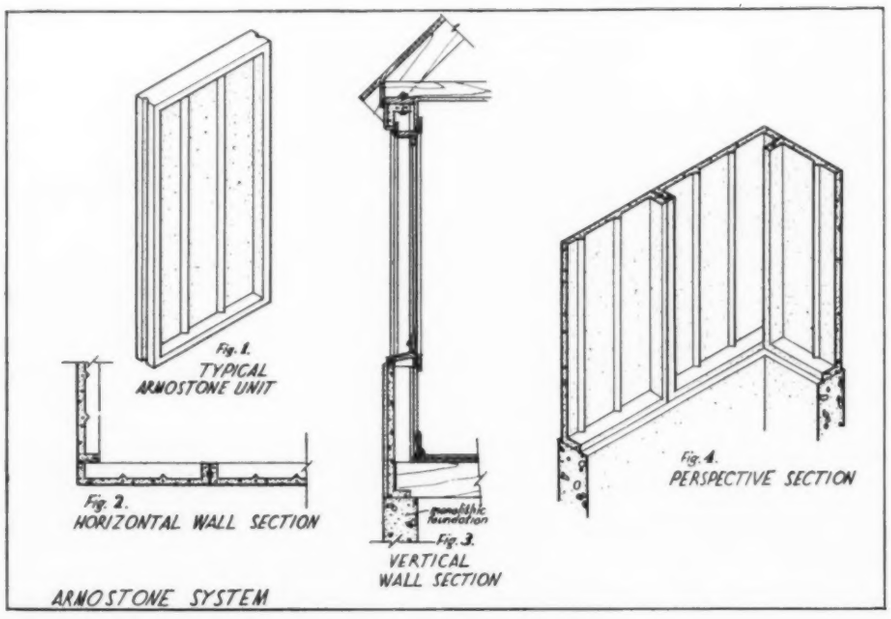
MONOLITH HOLLOW WALLS . . .

MONOLITH HOLLOW WALL COMPANY, LOS ANGELES

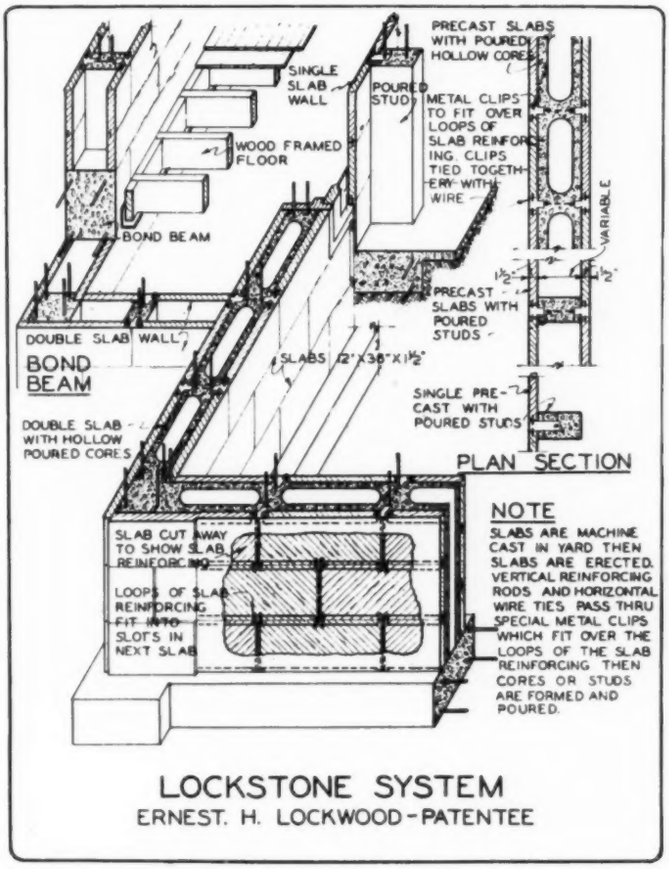
Reinforced concrete hollow walls poured in place (not a unit block construction). The exterior forms are wood, either 5/8" plywood or boards. These exterior wood forms, together with the reinforcing steel, are set up the full height of the wall to be poured. Wall core units are set into the forms as the placing of the concrete progresses. The collapsible metal wall core is made in units which are 30 inches high and so constructed that they can be set one on top of the other to any desired height. The wall is poured the full story without "cold" joints. Cores are removed in from 8 to 12 hours after the concrete has been poured. The hollow spaces in the wall provide insulation. Exterior plaster is usually omitted; interior plaster is applied directly to the concrete surfaces. The exterior is brush-coated to any desired color. The total cost of a building with hollow walls is about 10 per cent more than ordinary frame and stucco construction.

ARMOSTONE SYSTEM . . . DEVELOPED BY CONCRETE HOUSING CORPORATION OF AMERICA, NEW YORK

A system of wall construction employing precast units about 3 feet long by story height. The units are 1 inch thick with flanged edging all around and intermediate vertical stiffening ribs. Slab and ribs at edges and intermediate points are reinforced. The vertical edges are grooved in order to hold the mortar better. The foundations are prepared in the ordinary manner and the slab set thereon in a mortar bed. A wood plate is bolted along the tops of the erected slabs and wood attic floor and roof framing nailed thereto. The exterior is stuccoed. The inside is lathed and plastered, or plaster board is nailed to horizontal wood strips attached to wood inserts in the edge ribs.



From SURVEY OF CONCRETE HOUSE CONSTRUCTION SYSTEMS


PRECAST SLABS WITH POURED HOLLOW CORES
SINGLE SLAB WALL
POURED STUD
METAL CLIPS TO FIT OVER LOOPS OF SLAB REINFORCING. CLIPS TIED TOGETHER WITH WIRE
WOOD FRAMED FLOOR
BOND BEAM
VARIABLE
PRECAST SLABS WITH POURED STUDS
DOUBLE SLAB WALL
BOND BEAM
SLABS 12"X36"X1½"
SINGLE PRE-CAST WITH POURED STUDS
DOUBLE SLAB WITH HOLLOW POURED CORES
PLAN SECTION
NOTE
SLABS ARE MACHINE CAST IN YARD THEN SLABS ARE ERECTED. VERTICAL REINFORCING RODS AND HORIZONTAL WIRE TIES PASS THRU SPECIAL METAL CLIPS WHICH FIT OVER THE LOOPS OF THE SLAB REINFORCING THEN CORES OR STUDS ARE FORMED AND POURED.
SLAB CUT AWAY TO SHOW SLAB REINFORCING
LOOPS OF SLAB REINFORCING FIT INTO SLOTS IN NEXT SLAB
LOCKSTONE SYSTEM
ERNEST. H. LOCKWOOD - PATENTEE

From SURVEY OF CONCRETE HOUSE CONSTRUCTION SYSTEMS

LOCKSTONE SYSTEM . . . .

ERNEST H. LOCKWOOD, PASADENA, CALIFORNIA

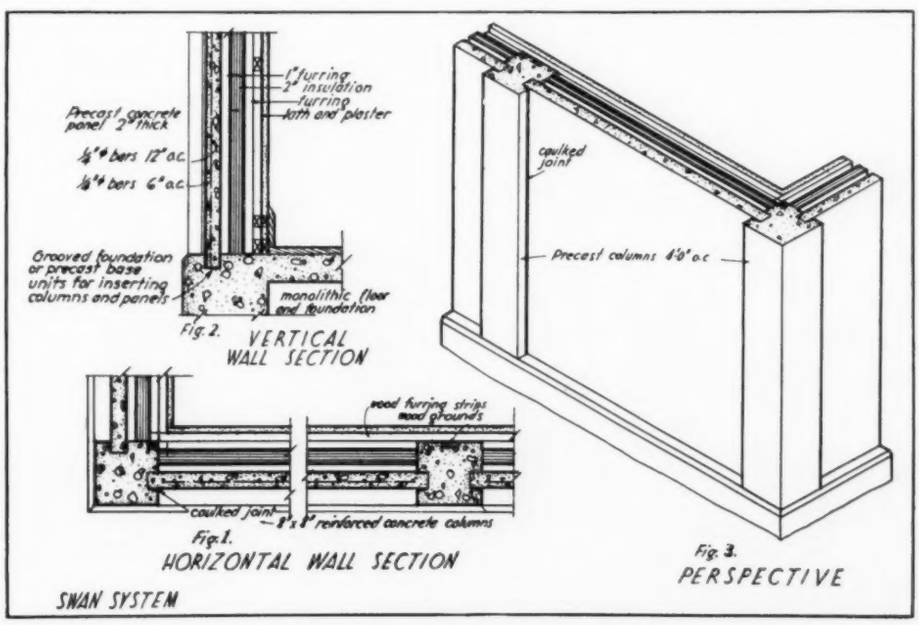
This system applies to wall construction and utilizes precast slabs 1½" by 12" by 36" erected on edge in single or double rows with intervening studs at frequent intervals or a cored or solid wall poured between the double row of slabs. Slabs are reinforced with a bar along each longitudinal edge. These bars are bent near the end so as to protrude from the edge and key with a corresponding slot in the slab above in the wall. Slabs are cast flat by a patented machine.

In the construction of walls, one or two rows of slabs are erected with staggered vertical joints. Flat metal ties placed at all slab junctions hold opposite sides in exact alignment. For hollow walls metal cores or stud forms are spaced within the slabs and concrete poured. For single faced walls, metal stud forms held against the slabs by ties inserted in joints are filled with concrete. Bond beams and corner columns generally are provided. The joints are pointed and as the slabs are attractively finished in the mould, they need no further treatment.

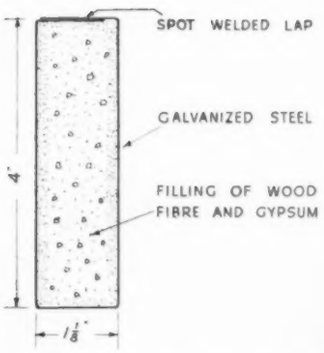
SWAN SYSTEM . . . . .

DEVELOPED BY FRANK S. SWAN, SWAN HOUSE, INC., CHICAGO

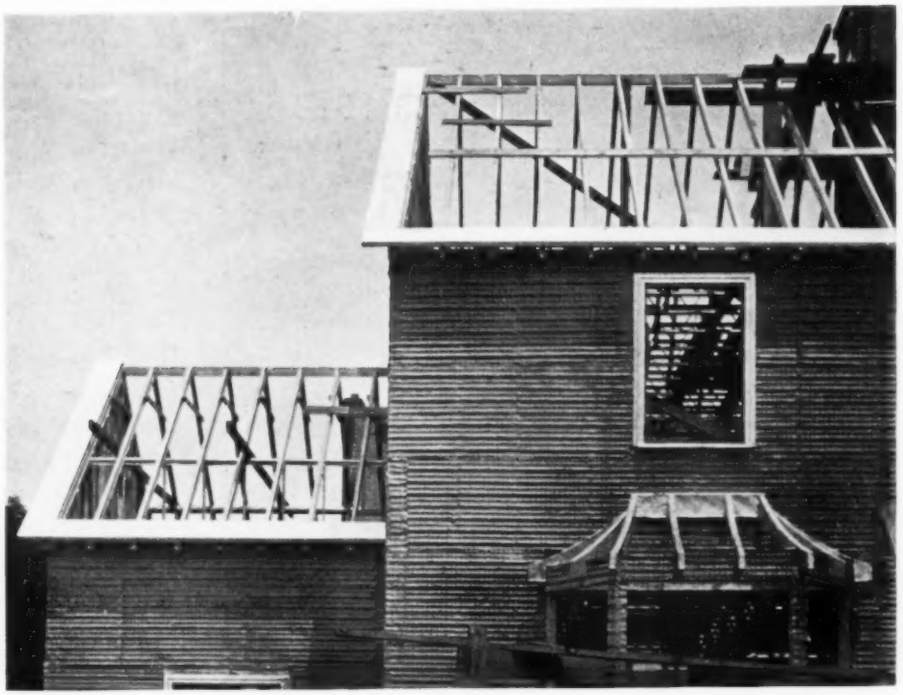
This system employs precast concrete studs spaced about 4 feet apart and precast slabs set between with edges inserted in the stud groove. Exterior surfaces are finished in the mould. The studs are story height. The slabs are 2" thick, 3'-4" wide and 2' to story height. In one-story houses a wood plate bolted to tops of studs extends around the wall. Reinforced belt course is built at first floor level in two-story houses. All joints are made with emulsified asphalt pointed with cement mortar. Special insulating materials, such as gypsum block, cork board, are erected between the studs and immediately inside of the slab.



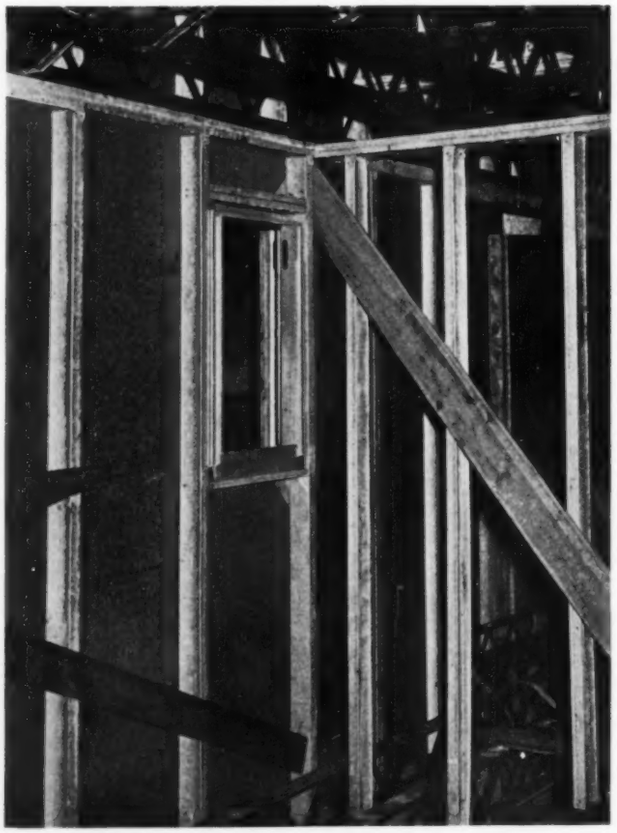
From SURVEY OF CONCRETE HOUSE CONSTRUCTION SYSTEMS



DETAIL OF METAL CLAD GYPSUM STUD, USED FOR FRAMING. CAN BE NAILED, SAWED AND DRILLED

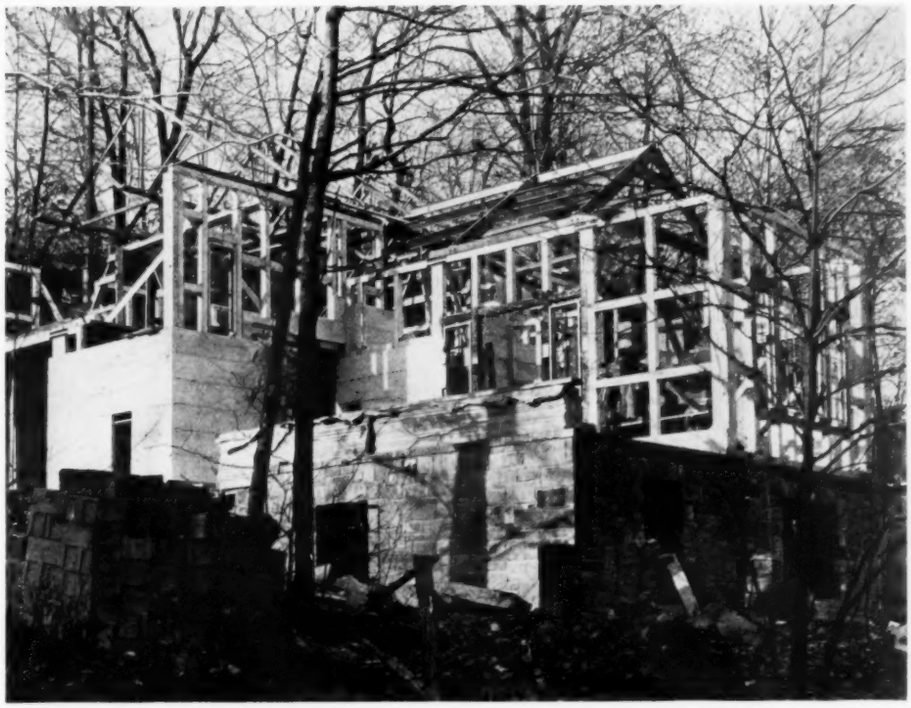


EXPERIMENTAL HOUSE AT HEMPSTEAD, LONG ISLAND



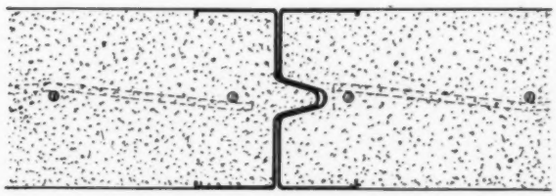
Photographs by Gustav Anderson

A feature of this house is its fireproof quality, developed by an ingenious framing of sheet metal with a filling of gypsum and wood fiber. The rake of roof and cornice edge is similarly constructed of metal with a filling of gypsum. The exterior faces of the house have an applied metal lath with paper backing as a base for stucco. Aluminum foil between studs and joists provides insulation against cold and heat. Floors and roof are surfaced with a mixture of slag and cement. All truss beams are welded. The method of construction differs very little from the construction of an ordinary wood frame house. Such elements as windows and doors are standard.



An experimental house, designed by Cecil Clair Briggs, architect, and utilizing gypsum structural framing produced by the American Cyanamid & Chemical Corporation, has been erected in New Jersey. Framing members are bolted together. The exterior facing consists of gypsum planks nailed to the frame. A waterproof, elastic cement is troweled to the surface as a single application. The walls and framing are watertight, fireproof and free from danger of attack by termites.

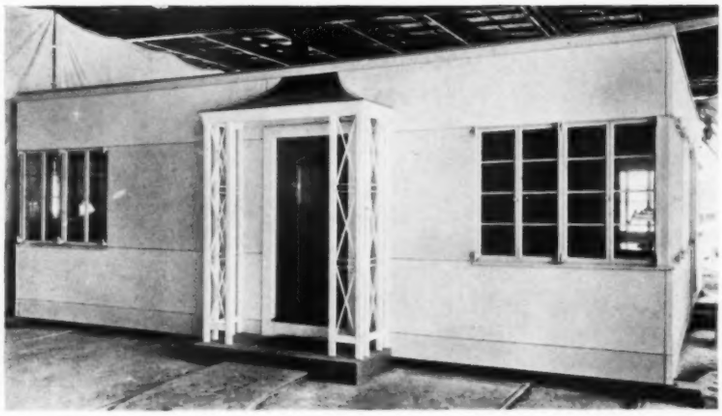
GYPSTEEL PLANK FOR FLOORS AND ROOFS



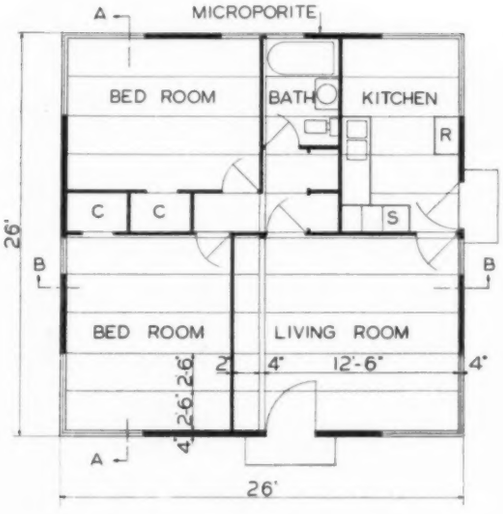
As units are erected, the edges mesh together to form a 2" I-beam which spans the distance between, and passes over, the supporting steel joists or purlins. "Tongues" and "grooves" are tapered so that they mesh as easily as wood decking to form a solid floor or roof deck.

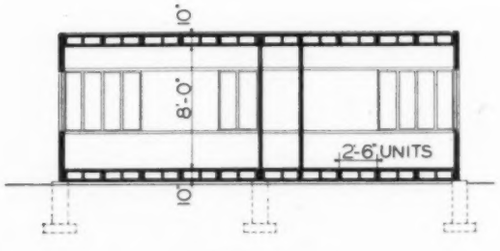
For floors the planks may be laid over either wood or steel joists of any type and of either uniform or variable spacing. Spans between joists up to 5 feet are suitable. Where a thin finish flooring, such as linoleum or composition tile, is to be applied over the plank without intermediate fill of substantial thickness, it is recommended that spans be limited to 4 feet. Linoleum, mastic tile and similar flooring may be laid over 1/4" minimum coat of "Plankote" (manufactured by American Cyanamid & Chemical Corporation) troweled over the plank surface by the linoleum or tile contractor.

Planks are used for roofs in a manner similar to that for floors. End joints are staggered and need not come over the supports. Clips are used for fastening to joists.

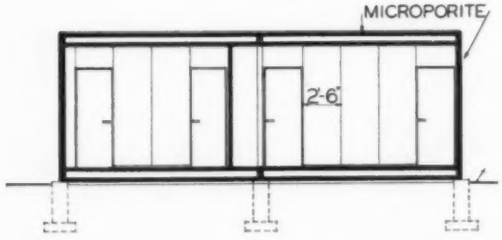


"MICROPORITE HOUSE" . . . . DEVELOPED BY PIERCE FOUNDATION, NEW YORK





SECTION A-A



SECTION B-B

Characteristics of "Microporite": Indurated calcium hydrosilicate. Inorganic. Incombustible. Insoluble in water, highly resistant to action of corrosive salts and acids. Neutral (pH near 7). White. Weight, 28 pounds per cubic foot. 75-80 per cent void. Pores submicroscopic. Compressive strength, 1,000 pounds per square inch. Tensile strength, 100 pounds per square inch. Modulus of rupture, 200 pounds per square inch (without reinforcing). Heat transmission, 0.70 B.t.u./hr./sq. ft./°F./1" thickness. Heat capacity, low. Sound transmission loss for 2" partition: average, 32 db. (at 300–1,000 cycles); minimum, 25 db. (at 200 cycles); maximum, 42 db. (at 1,000 cycles). Sound absorption, high. Fire resistance: on sample 2" thick, 1,832° F. one side for one hour, other side raised 18°. Resistance to freezing: average of 15 cycles of alternate freezing and thawing to disintegrate. Freezing has no effect unless material is wet.

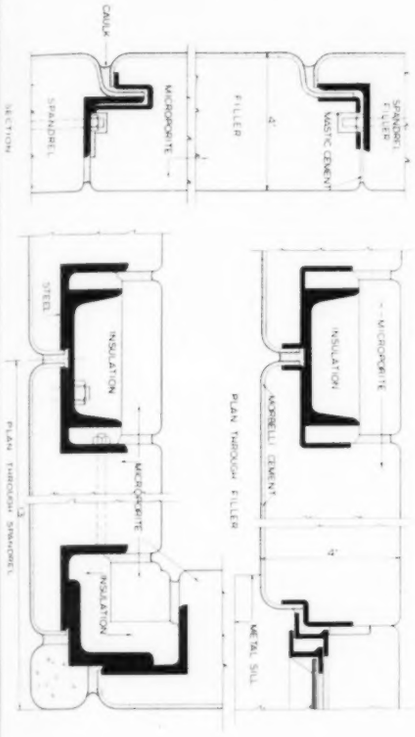
Structural System: Steel columns on concrete piers on 13-foot centers. Exterior wall slabs (structural) are 12'-6" x 2'-6" x 4", bolted to columns. Floor and roof slabs are 12'-6" x 2'-6" x 10" (hollow), carried on exterior wall and central steel girder. Partitions are nonbearing; panels are 8'-0" x 2'-6" x 2", held in place by floor and ceiling mouldings. Same structural system and units used for single or multi-story buildings—residences, apartment houses, office buildings, schools, factories, and the like.

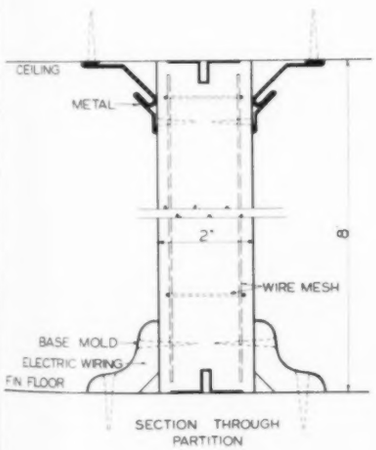
Surfacings: Exterior surface—1/8" thick "Morbelli," a very dense, inexpensive fibro-cement. This material is chemically and mechanically bonded to the "Microporite." Permeability to water, 1.7 milliliters per square foot in 48 hours under 2" head. Can be made in great variety of colors and textures; requires no paint or other maintenance. Interior surface—wall, partition, and ceiling—chemically hardened; can be painted or papered or left in natural white color, or integrally colored. All finishes are factory-applied.

Joints: A permanently elastic expansion joint in strip form is used for all joints. The edges of the sections are buttered with Latex-Alumina cement before they are put in place. All joints are exposed; no batten strips or mouldings are used. A shiplap type of joint is used for exterior. All metal is kept within the thickness of the wall; there is no through conduction.

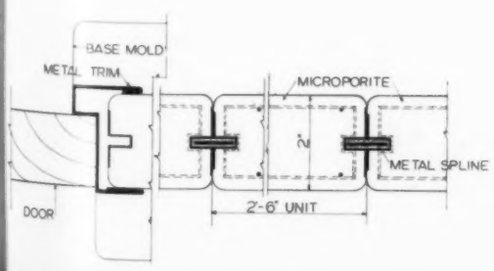
Method of Erection: Holes for piers are dug and steel frame erected on temporary supports. Exterior wall sections are bolted to columns and floor, and roof slabs are bolted to outside walls and steel girders. After the structure has been squared and leveled, the concrete piers are poured.

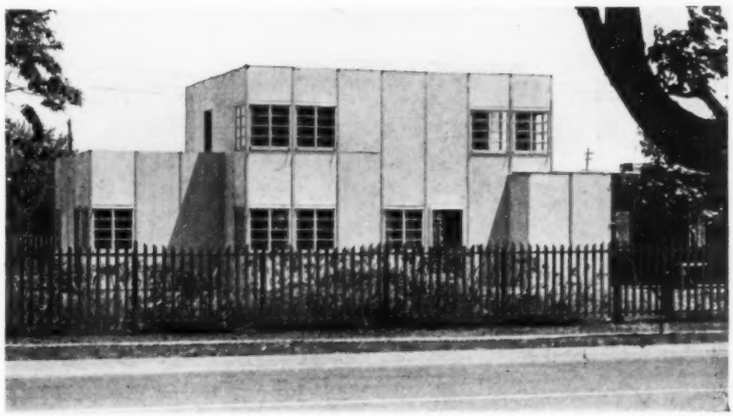
DETAILS OF MICROPORITE CONSTRUCTION





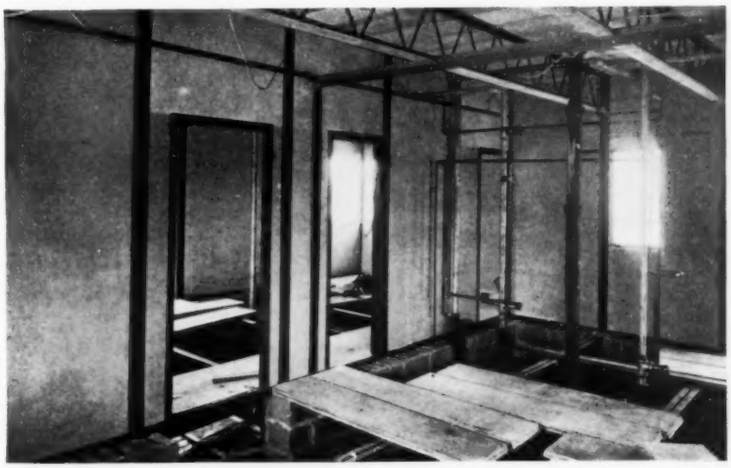
SECTION THROUGH PARTITION





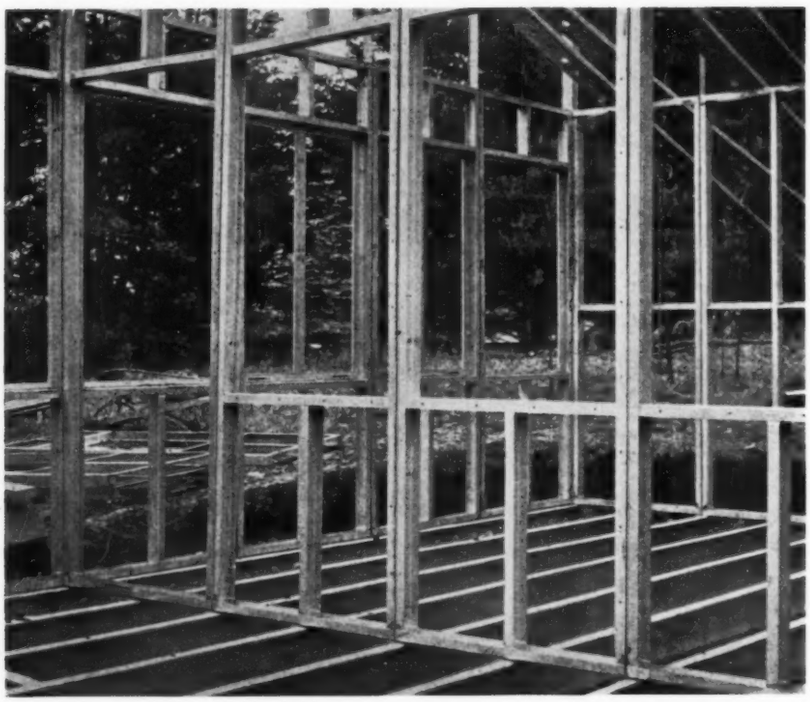
"MOTOHOME" AT GARDEN CITY, L. I.

DEVELOPED BY AMERICAN HOUSES, INC., NEW YORK



Construction: Steel frame. Exterior walls—"Pyrestos" panels with aluminum trim. Floors and roof of "Minropak," a mineral compound, 2 inches thick and reinforced with steel. Steel casement windows.

Photographs by Gustav Anderson



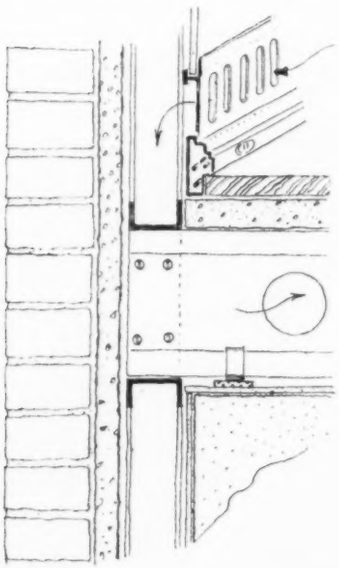
RIGID BERLOY STEEL FRAMES ARE BOLTED TO STEEL FLOOR JOISTS

BERLOY STEEL-FRAME HOUSE . . . . .

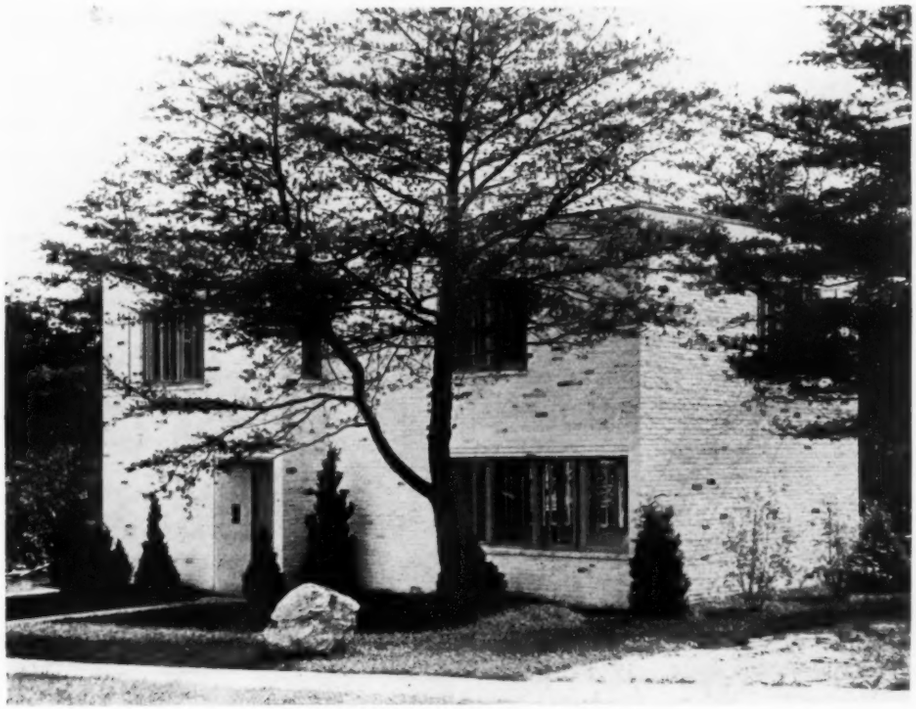
DEVELOPED BY THE BERGER MANUFACTURING COMPANY OF CANTON, OHIO, A SUBSIDIARY OF REPUBLIC STEEL CORPORATION.

The keynote of the Berloy system is the fabricated steel frame or skeleton—each unit of which has been designed to be easily handled by one man. This means no erection machinery on the job. The Berloy House differs from what is popularly known as a "steel house" in that only the frame is of steel. The exterior may be finished with any building material now in use, permitting wide variety in appearance.

AIR DUCTS FOR AIR CONDITIONING SYSTEM ARE BUILT INTO THE STEEL FRAMES



BERLOY STEEL-FRAME UNITS WEIGH 42 POUNDS

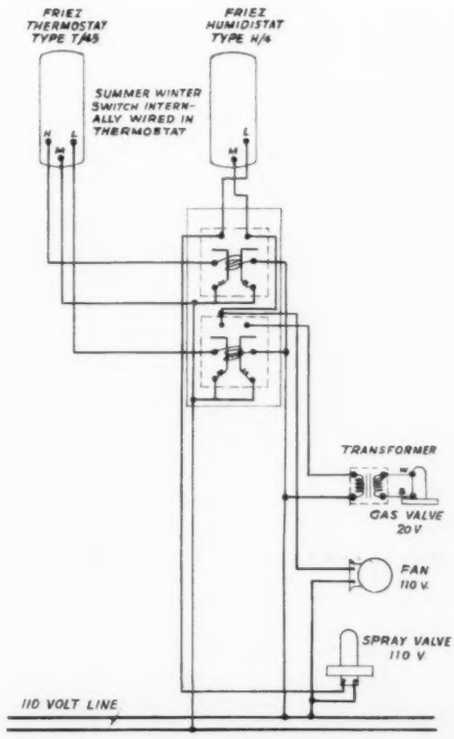


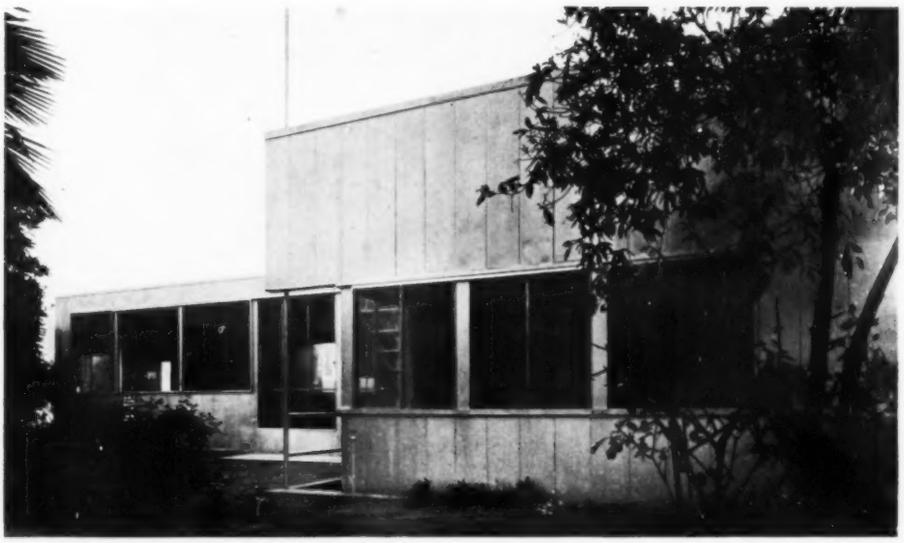
BERLOY HOUSE ERECTED AT WASHINGTON, D. C.—KASTNER AND STONOROV, ARCHITECTS

Air conditioning: Special Friez automatic control instruments are used on the Berloy houses. The equipment provided on these sets comprises the following: summer - winter thermostat, with built-in, change-over switch and ready interwired; humidistat; special relay set, containing two relays mounted into single "knock-out" type hinge-lidded box, 6" x 3" x 9" deep, and complete with diagram. The wiring is shown on accompanying diagram. The humidistat and thermostat are mounted side by side in the living quarters and the connections to the gas valve, fan and spray valve on the special Bryant Air Conditioner are shown in the diagram. The relay box is sunk flush with the kitchen wall, right across from the air conditioner itself.

In winter: On falling temperature the fan is started and simultaneously the gas valve turned on. When the temperature reaches satisfaction point, both fan and gas are simultaneously turned off. On falling humidity the solenoid valve to water spray is turned on but it is so arranged that this can only take place if the heater is running. This is desirable to prevent humidity spray from running unless there is distribution by means of the fan. Similarly, little or no humidification will be achieved unless heat is present in the air.

In summer: The summer - winter switch, which is mounted integrally into the thermostat cover, is thrown to the summer position and the following functions take place: If the temperature rises above the point set on the thermostat, the fan is started and simultaneously the cold water spray started. On satisfaction of the thermostat the fan and spray are simultaneously shut off. If it is desired that the humidistat should never be able to turn on the spray, the setting knob can be turned back to some low point, say 20 per cent, below which the humidity would never drop during summer; the spray would then never come on unless under demand of the thermostat. In the Berloy demonstration house cold water from an artesian well is available for cooling.





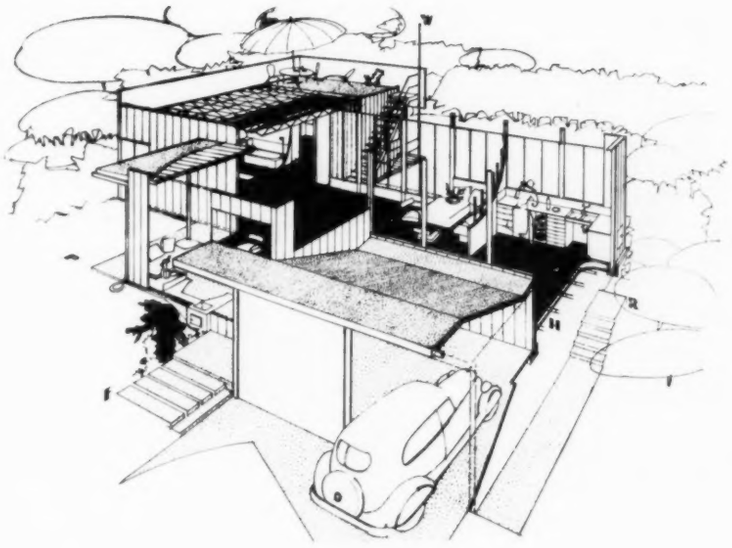
CELLULAR
COPPER-BEARING
STEEL HOUSE

BUILT
FOR WILLIAM BEARD
ALTADENA, CALIFORNIA

RICHARD J. NEUTRA
ARCHITECT
GREGORY AIN, ASSOCIATE

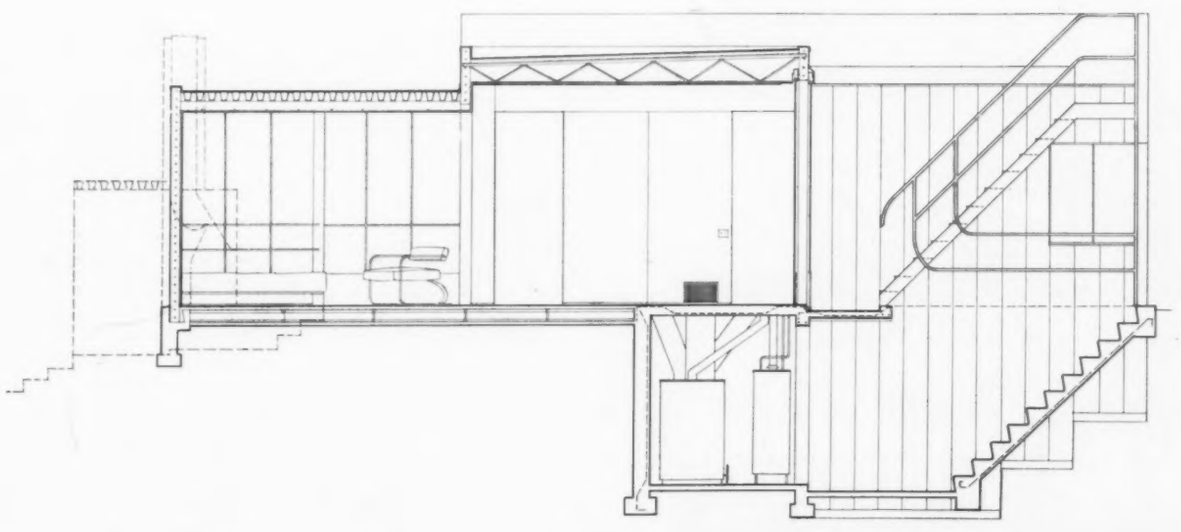
Photograph by Luckhaus Studio

This house utilizes the standard Robertson steel (Keystone) floor system for both walls and horizontal spans. The vertical wall elements are erected in multiple sections. They are placed in a typical grooved concrete footing which is then grouted with waterproof cement to produce a fixed bearing of the wall elements. These now act like upright cantilevers and individually are designed to take lateral stresses of wind pressures or earth shocks. The joint of the standard section is tightened with caulking rope and compressed A. C. Horn "Vulcatex," a rubber-like vulcanization of china wood oil applied with an air gun, which permits relative elastic movement of the series of bottom-fixed cantilevers. Lintels are formed of the same sheet steel elements, which are traversed by ¾" round steel bars to take tension stresses at the bottom zone of such girders and combine the top zone to compressive strength.



The ground floor is double shell construction of 12" overall depth. The upper slab of integrally colored and waxed "Diatom" cement composition is carried by cross-braced trussed open-web steel channel studs. It encloses a plenum chamber of 6" clear depth which extends under the entire building and into which, when desired, hot air is pressed electrically from the furnace. The "Diatom" cement slab forms and acts as a low-temperature radiating panel during the cold season, while a retarded convection carries the air volume of the sub floor void into the vertical hollows of the cellular steel walls.

On facades exposed to direct sun radiation, small intake openings at the foot of the cellular steel elements initiate simultaneously with the warming up of the exterior surface an automatic air convection to cool these walls and minimize heat transmission to the interior caloriferic insulation board lining. The sun rays themselves operate this cooling system.

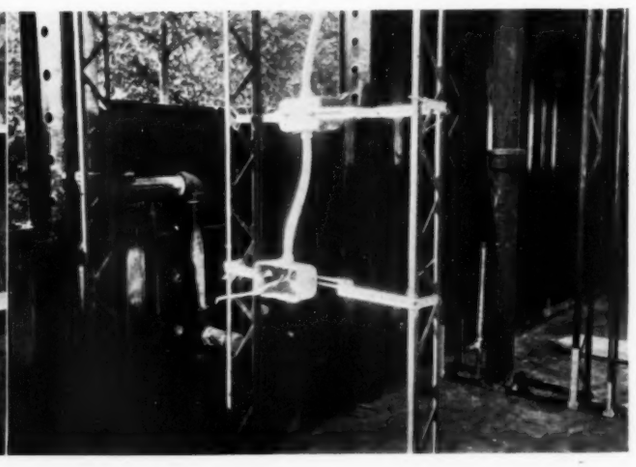


Cellular steel wall elements . . . .

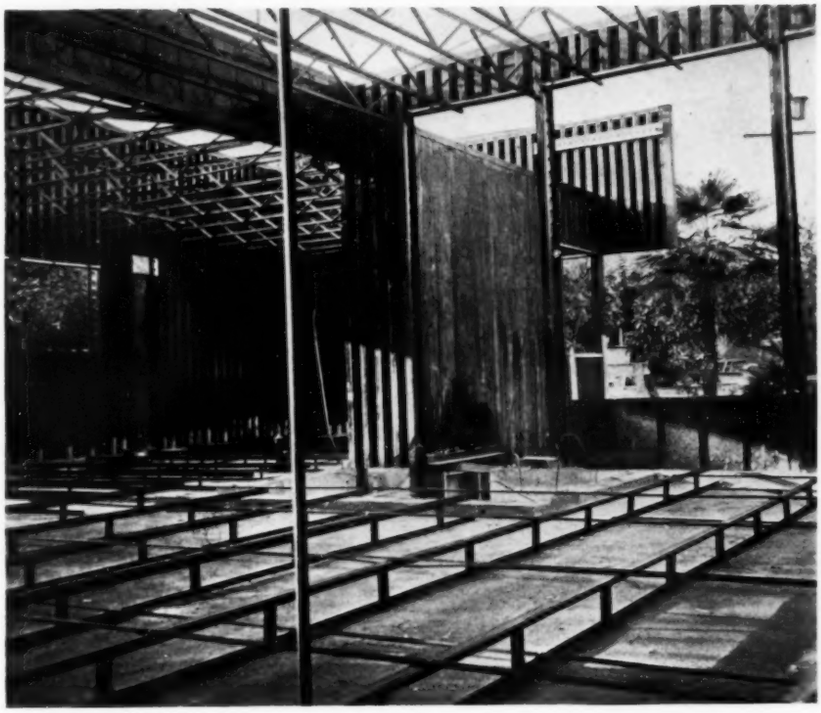
. . . are erected on grooved footings.

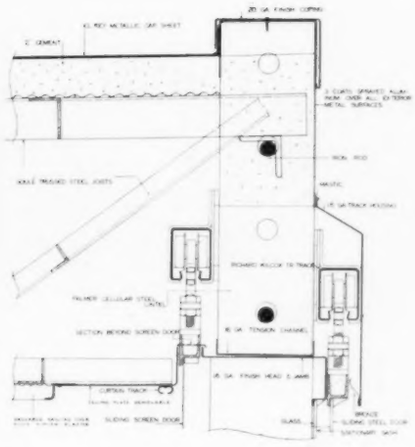
CELLULAR STEEL HOUSE AT ALTADENA, CALIFORNIA

Arc-welding of steel wall elements.



Utility conduits and fixtures.

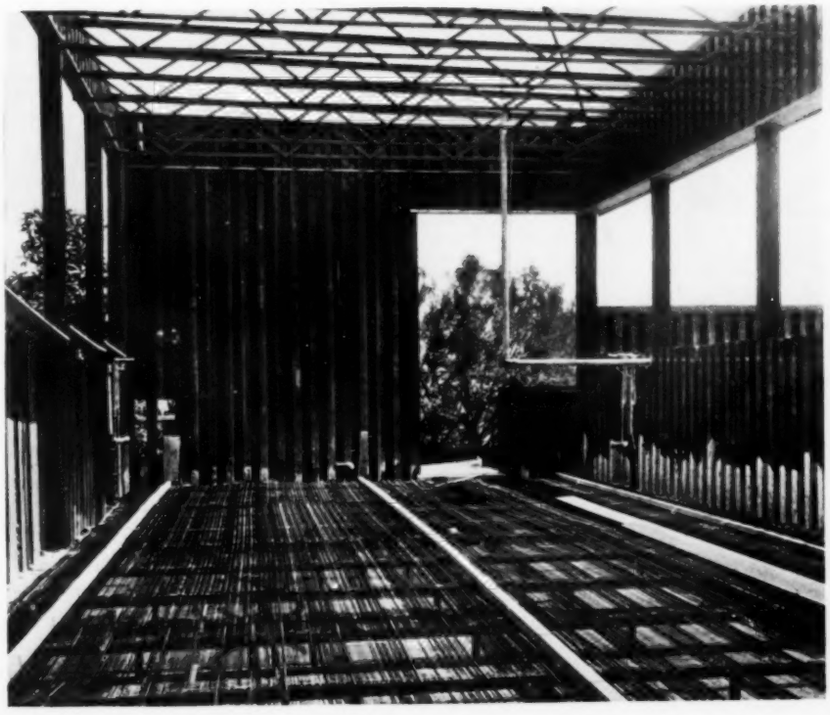


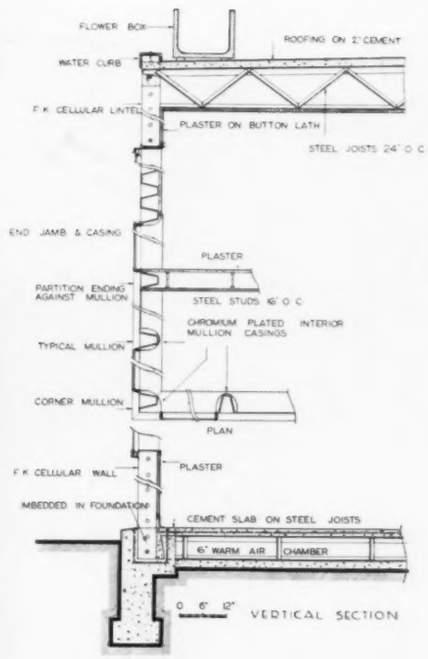


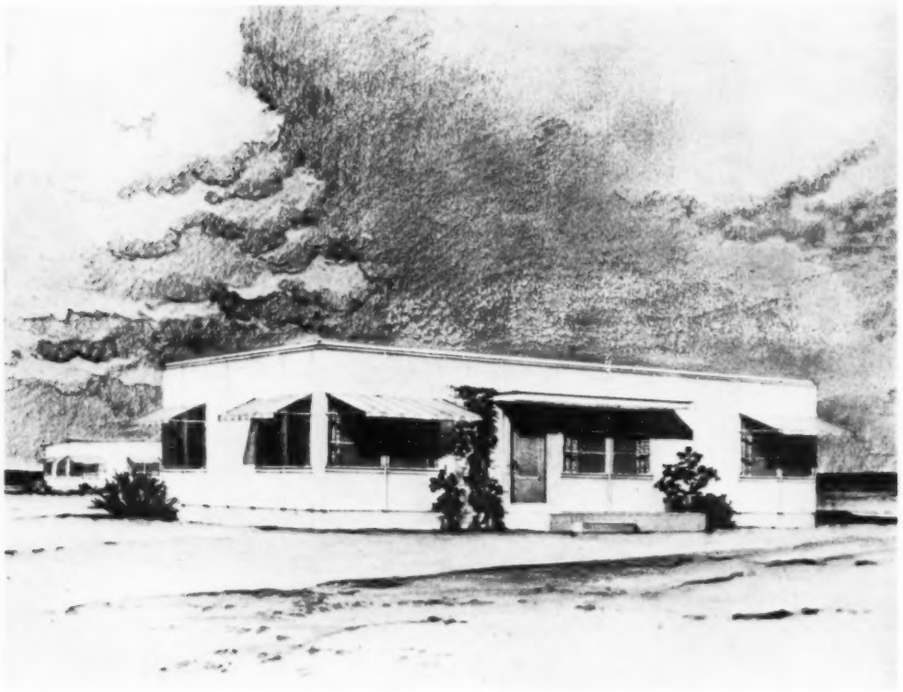
LINTEL OVER SLIDING STEEL GLASS DOORS

Hollow steel floors form plenum chamber for panel heating. . . .

RICHARD J. NEUTRA, ARCHITECT — GREGORY AIN, COLLABORATOR





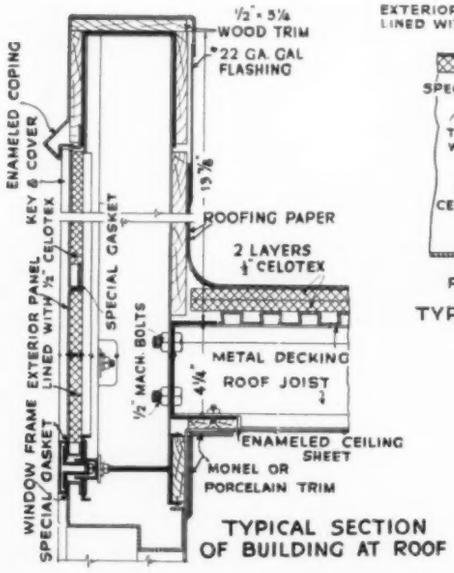


PORCELAIN STEEL HOUSE . . . . .

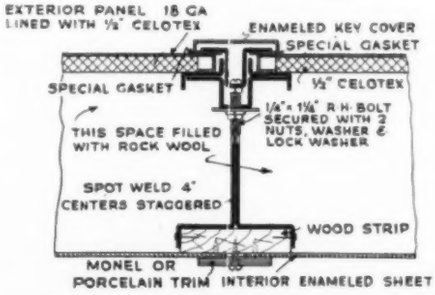
DEVELOPED BY PORCELAIN STEEL BUILDINGS COMPANY . . . COLUMBUS, OHIO

This company started its development of porcelain steel construction in 1925. The first building was erected in 1928, and since then 36 porcelain steel buildings have been constructed. All have been commercial buildings (lunchrooms). The house design illustrated above is a recent addition to the company's production: it is under consideration at present by several oil companies who expect to use the house in developing leases.

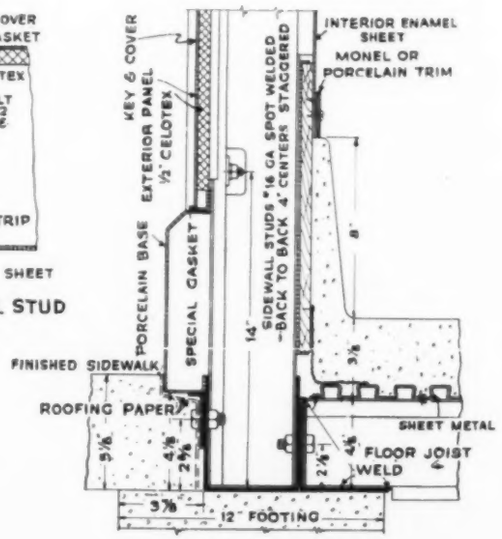
In the last 10 buildings erected, glass wool has been used for insulation. A ½" low density insulating board is cemented on inside of panels for sound insulation. On the roof two ½" layers of insulation board are used for thermal insulation.



TYPICAL SECTION OF BUILDING AT ROOF


EXTERIOR PANEL 18 GA LINED WITH ½" CELOTEX
ENAMELED KEY COVER
SPECIAL GASKET
SPECIAL GASKET
½" CELOTEX
¼" × 1¼" R.H. BOLT SECURED WITH 2 NUTS, WASHER & LOCK WASHER
THIS SPACE FILLED WITH ROCK WOOL
SPOT WELD 4" CENTERS STAGGERED
WOOD STRIP
MONEL OR PORCELAIN TRIM
INTERIOR ENAMELED SHEET

TYPICAL DETAIL OF SIDE WALL STUD

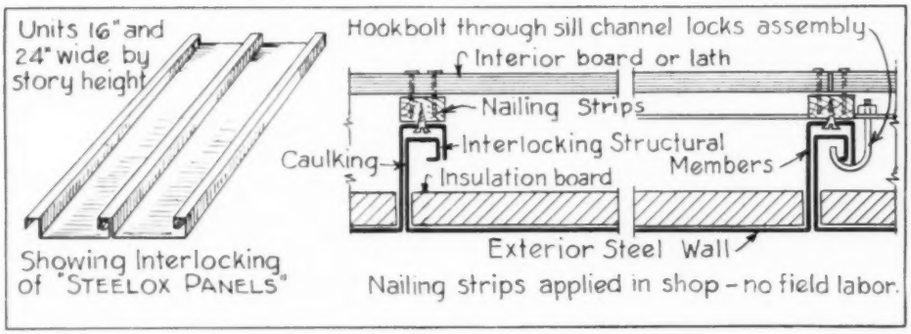


TYPICAL SECTION OF BUILDING AT BASE

STEELOX HOUSE

DEVELOPED BY
INSULATED STEEL
CONSTRUCTION COMPANY
MIDDLETOWN, OHIO

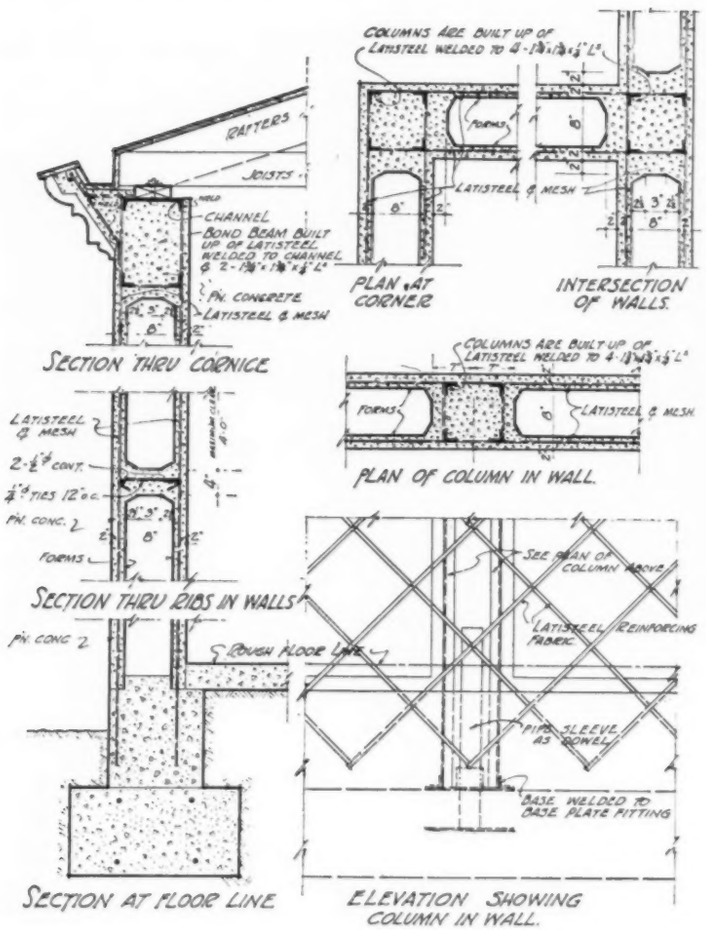
STEELOX CO., CHICAGO

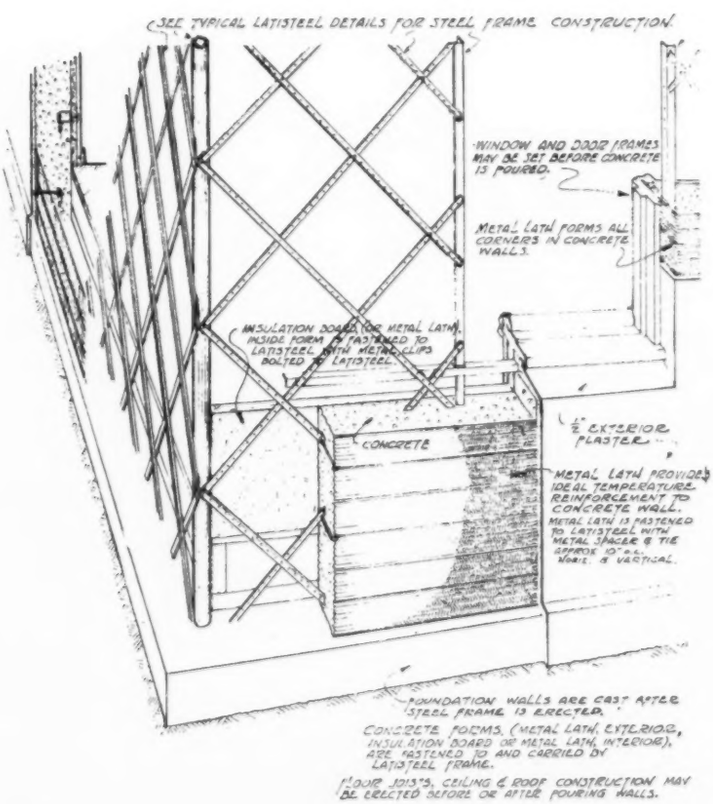

Units 16" and 24" wide by story height
Showing Interlocking of "STEELOX PANELS"
Hookbolt through sill channel locks assembly
Interior board or lath
Nailing Strips
Interlocking Structural Members
Caulking
Insulation board
Exterior Steel Wall
Nailing strips applied in shop – no field labor.

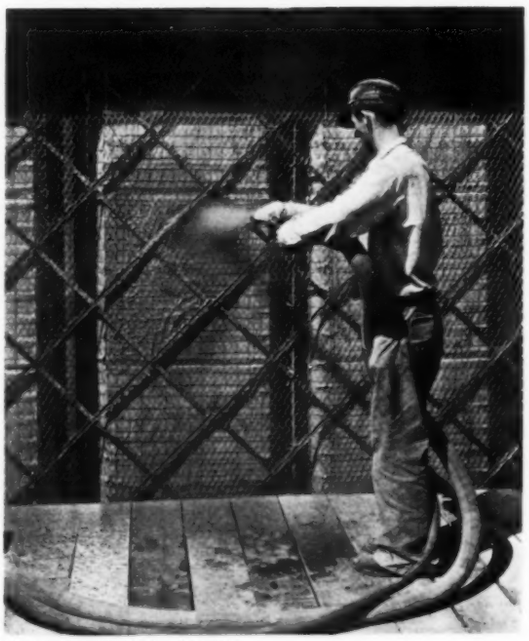
Walls and roof are made of 20-gauge heavily galvanized Armco steel channel-shaped sections 16" wide and with flanged sides. The flange on one section easily and securely interlocks with the flange on the adjoining section, forming strong, rigid steel columns which serve as studding or rafters. All wall and roof sections are of like length, excepting the gable ends. Parts are interchangeable and every piece is accurately cut to fit before it leaves the factory. No special tools are required.

The first step in erection is to attach the heavy 12-gauge galvanized base angles, wrapped in asphalt strips, to the foundation with expansion bolts. A corner section is then set on the angle and one by one the inner wall units are set in place and fastened to the base angle by a simple hook bolt. A calking compound tightly seals each joint. When a window opening is reached, shorter units are used. Next, the top plate is placed in position and hook-bolted, the short units over doors and windows inserted and fastened, and the wall is finished. The roof is assembled in almost the same manner. Each roof section has a small plate riveted to the underside which slides down over the top wall plate, and is fastened to a special ridge cap. The flanges of the roof sections are turned upward, forming a tight standing-seam roof which defies the wind and rain.

All walls are insulated with standard material, either board or bat form. Windows are weatherstripped. All materials necessary to complete the house (excepting cement, sand, gravel and other necessary materials) are supplied by the manufacturer. The house illustrated, with outside dimensions 42'-8" x 21'-4", is sold f.o.b. Middletown, Ohio, at $1,050. Price, including window shades, kitchen cabinets, and all plumbing and electrical fixtures and materials, is $1,350.




SEE TYPICAL LATISTEEL DETAILS FOR STEEL FRAME CONSTRUCTION
WINDOW AND DOOR FRAMES MAY BE SET BEFORE CONCRETE IS POURED.
METAL LATH FORMS ALL CORNERS IN CONCRETE WALLS.
INSULATION BOARD OR METAL LATH INSIDE FORM IS FASTENED TO LATISTEEL WITH METAL CLIPS BOLTED TO LATISTEEL.
½" EXTERIOR PLASTER
CONCRETE
METAL LATH PROVIDES IDEAL TEMPERATURE REINFORCEMENT TO CONCRETE WALL. METAL LATH IS FASTENED TO LATISTEEL WITH METAL STAPLES @ THE APPROX 10" o.c. WORK @ VERTICAL.
FOUNDATION WALLS ARE CAST AFTER STEEL FRAME IS ERECTED.
CONCRETE FORMS, (METAL LATH, EXTERIOR, INSULATION BOARD OR METAL LATH, INTERIOR), ARE FASTENED TO AND CARRIED BY LATISTEEL FRAME.
FLOOR JOISTS, CEILING & ROOF CONSTRUCTION MAY BE ERECTED BEFORE OR AFTER POURING WALLS.



Photograph by A. E. Arnold

LATISTEEL SYSTEM

DEVELOPED BY F. A. RUPPEL, ARCHITECT PASADENA, CALIFORNIA

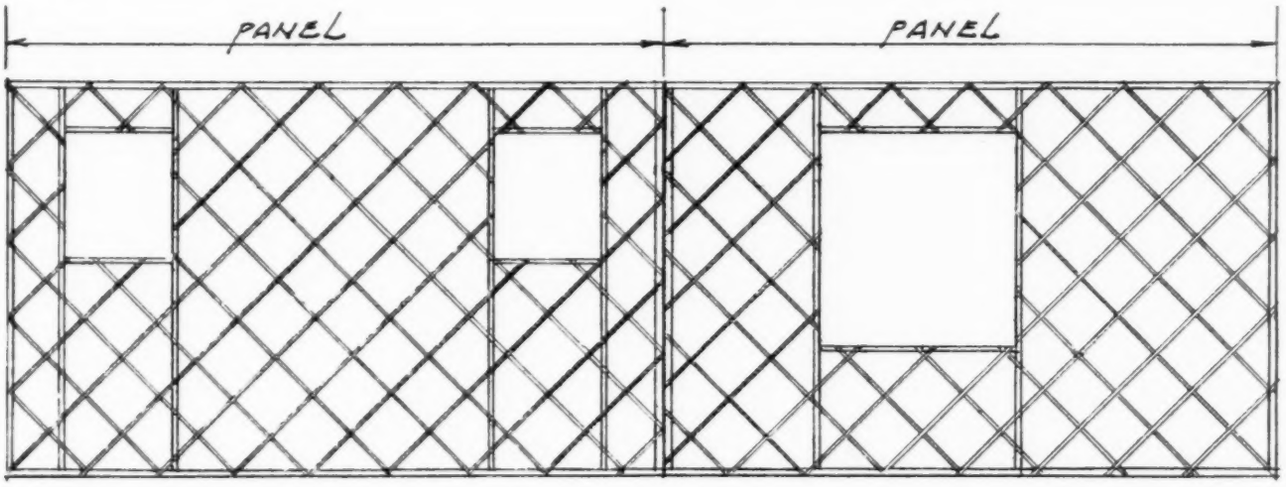
The Latisteel Corporation of California has developed and is distributing three types of steel frame which are competitive in price with building methods now in general practice. Each method is analogous in its functions with the others, and all three can be consistently combined in one design or structure.

Type No. 1 is developed by the site assemblage of factory fabricated steel wall panels easily handled by two men.

Type No. 2 is developed by the erection of a skeleton steel pipe framework of columns and beams, with the columns set and welded directly into heavy steel sleeves which are embedded in concrete. To this framework is welded a continuous and adjustable steel reinforcing fabric made of channels placed in closely spaced diagonal relation with one another and called Latisteel. The concrete foundations are poured after the steel framing is completed and embeds the lower sections of the Latisteel. The resulting steel frame is in effect a continuous series of tension trusses. This framework is further reinforced, protected and fireproofed by the application of concrete applied pneumatically, by hand, or by casting. When cast concrete is desired, the casting forms of reinforced rib metal lath are suspended from the frame itself by temporary steel whalers, and become an integral structural part of the wall.

Type No. 3 is developed with latticed structural steel columns and girders prefabricated of angles and heavy channels and provides a self-sufficient frame for heavy-duty and multi-story work. Latisteel fabric and plaster are used for filler walls.

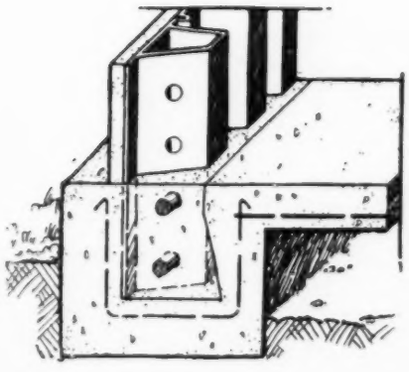
LATISTEEL SYSTEM: Prefabricated panels are bolted together at the job to form structural walls as shown in the sketch. These panels are built up in the factory of steel angles welded together and covered with a latisteel fabric likewise welded to angle frame. Openings are formed integral with panel frames. Holes are punched in angles for fastening sash and door frames.



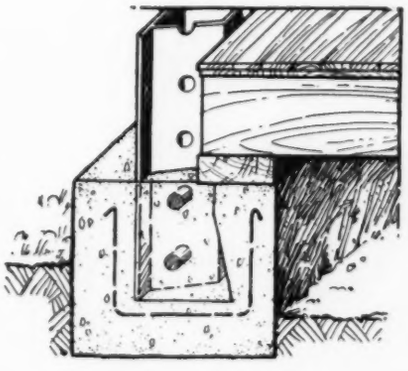
PALMER CELLULAR STEEL WALLS

ROBERTSON KEYSTONE BEAM STEEL UNITS

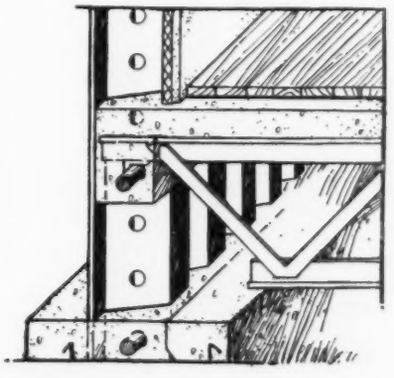
The feature of this construction system is earthquake resistance. Interlocking joints of units are welded every 2 feet and waterproofed with pressure caulking. Walls may be finished with enamel paint, composition board, plywood, stucco or any desired suitable facing.



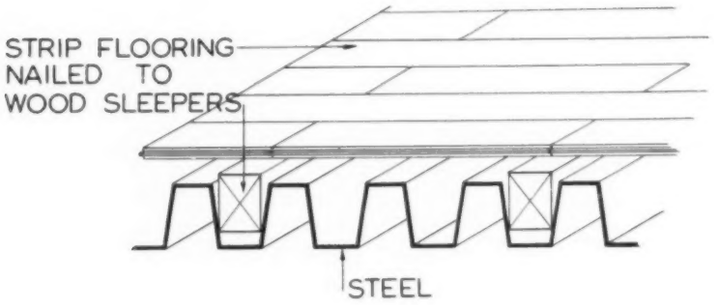
Steel walls are recessed in footings and act as cantilevers against lateral stress.



Steel walls and concrete footings are shown here in conjunction with wood floor.

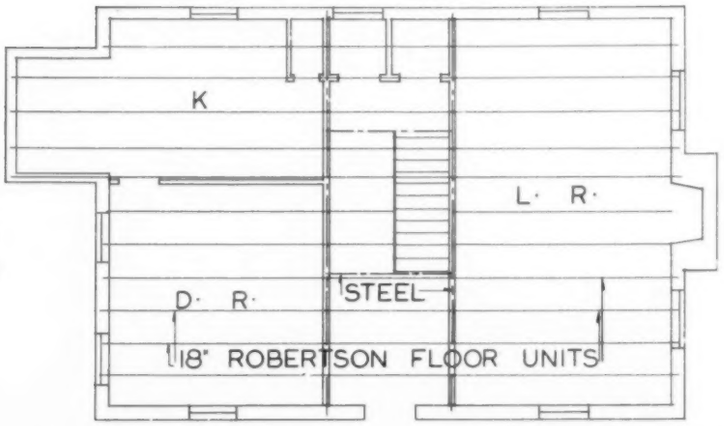


Joists bear on horizontal steel rod which runs through center of wall.



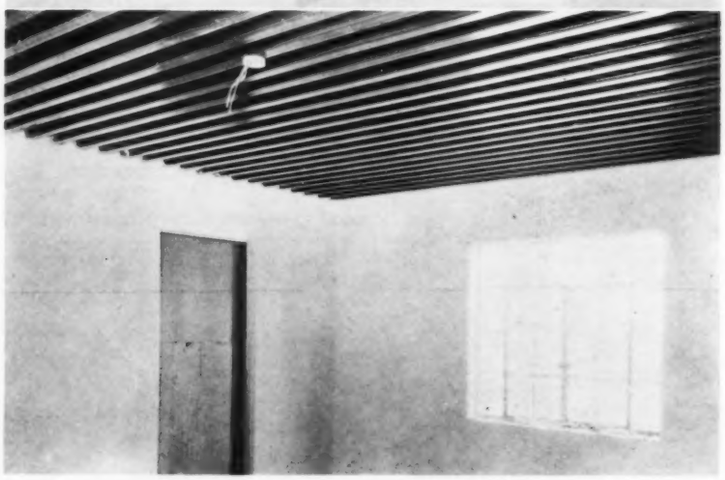
ROBERTSON SYSTEM

KEYSTONE CELLULAR STEEL UNITS

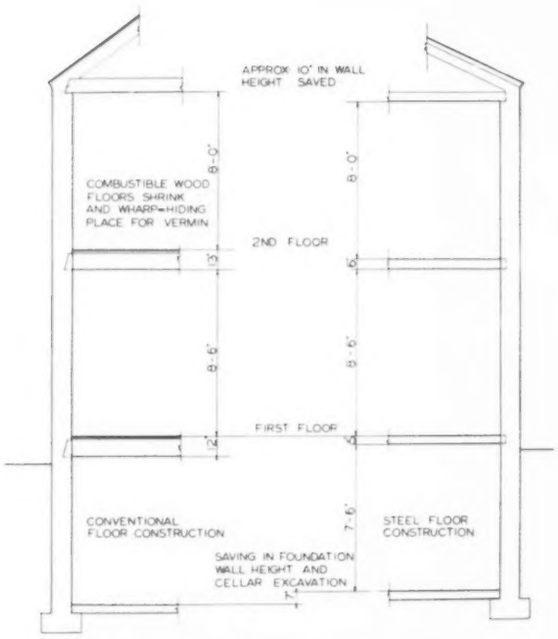


Floor plan of a typical six-room story-and-a-half house, showing the supporting plans required. It will be noted that in the layout the Keystone units are considered as planks 24" wide and 4½" in thickness. The technique in laying out these units is exactly the same as if wood planks of the same dimensions were used, except that bearing surfaces must be free from rivet heads, gusset plates and similar obstructions.

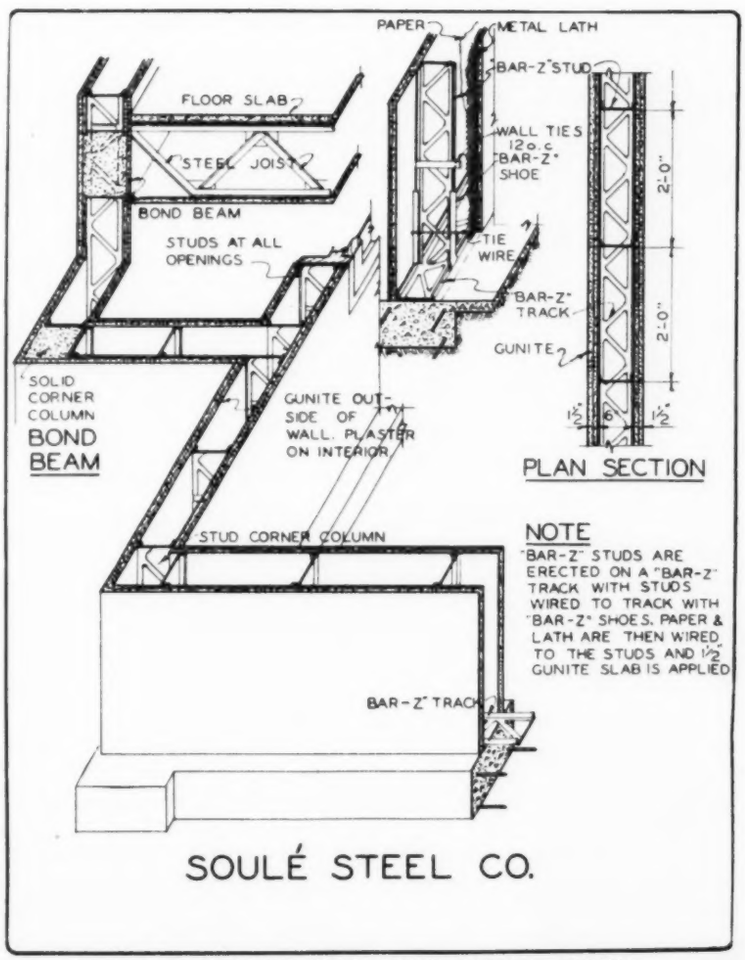
A flat ceiling detail showing the flat plate of the FK type unit turned downward. The joints between units have been filled with plaster of paris. The entire surface will later be painted. The wiring is carried through the cells of the cellular steel units.



Robertson cellular steel units with cells turned down to give a beamed ceiling in the dining room. The space between the cells at the wall bearing is plastered. The cells are to be decorated. The ceiling wiring is carried within the cells of the units.



COMPARISON OF CONVENTIONAL FLOOR AND ROBERTSON KEYSTONE FLOOR CONSTRUCTION

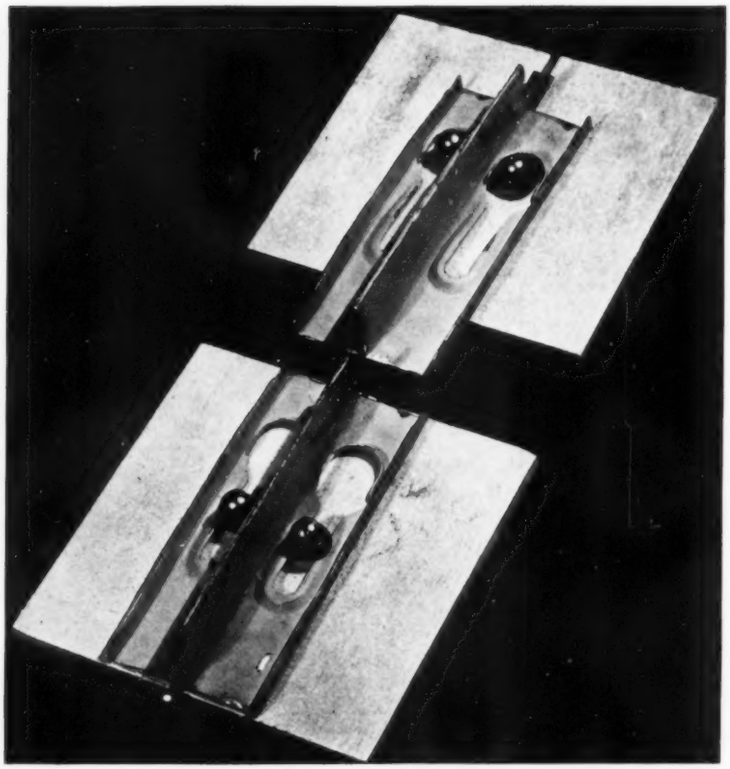


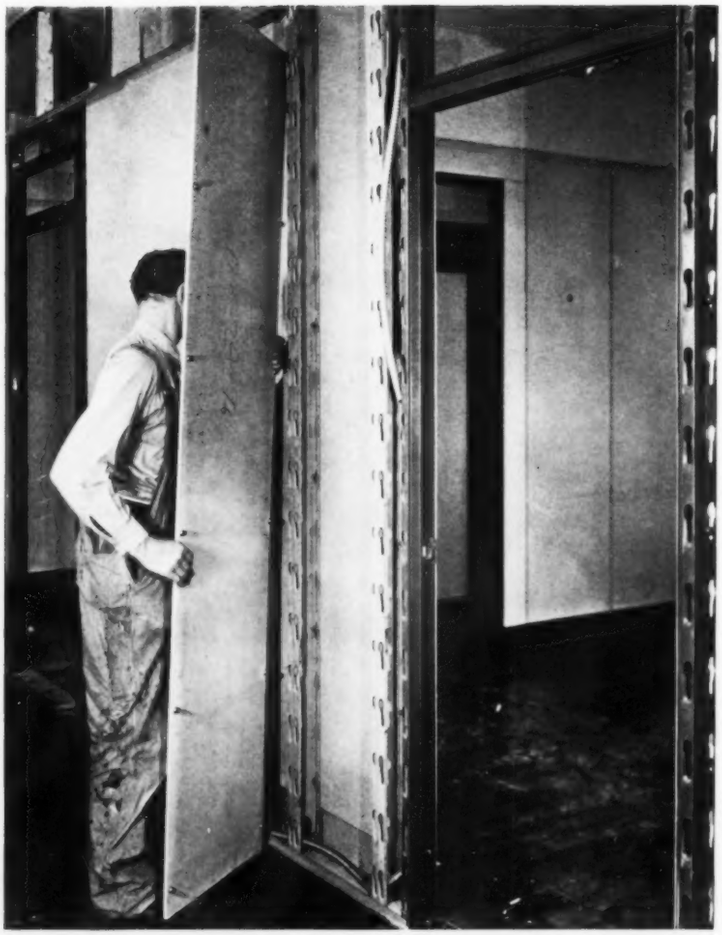
From SURVEY OF CONCRETE HOUSE CONSTRUCTION SYSTEMS

BAR Z GUNITE SYSTEM

DEVELOPED BY SOULÉ STEEL CO. LOS ANGELES

This is a system of building walls having open web steel studs 24" on center and outer and inner wall surfaces of stucco or gunite applied on 3.6 lb. metal lath. The studs are made in 2" to 6" widths and lengths up to 20 feet. Edges are flanged. In construction, lengths of these sections are fastened in a flatwise position to the top of the foundation to serve as a "track" to which the uprights are attached by means of a connecting shoe. Wall ties are shop welded to the studs. Ties have forked ends which are bent around the stucco lath. Structural connections such as stud to "track" are field welded prior to attaching lath. Exterior stucco or gunite generally is $1\frac{1}{2}$" to 2" thick. Reinforced concrete corner columns and belt courses at floor and roof levels are built. Floors are built of open-web steel joists with concrete slab on metal lath.





J-M TRANSITE WALLS

DEVELOPED BY JOHNS-MANVILLE, NEW YORK

Screw heads on the back of the "Transite" sheet in the workman's hands are placed in the top part of the key-holes on the studding. When the sheet is pushed down, a patented spring device holds the sheet snugly against the studding, capable of withstanding a pull of 800 pounds.

HEATING THE SMALL HOUSE

A CHECK LIST COVERING INSULATION, HEATING METHODS, FUELS AND UTILITY ROOM

By THEODORE F. ROCKWELL, Instructor in Heating and Ventilation
Carnegie Institute of Technology

To keep expenditures for heating and ventilating consistent with a total cost of $5,000 or $6,000 for the house means that the initial cost of such equipment shall not exceed $700.[1]

For a 70° F. temperature difference, the heat loss from a house of this size is about 80,000 B.t.u./hr. (330 sq. ft. EDR). Houses of modern design with flat roofs may tend to exceed this amount.

I. INSULATION

A. INTRODUCTION

The outside walls and ceilings of all houses should possess sufficient resistance to the flow of heat so that with an inside air temperature of 70° F. the temperature of the inside surfaces of these walls and ceilings will remain higher than 62° F. during the periods of minimum temperature outside. Such surface temperatures are necessary for adequate human comfort.[2,3]

Unless the outdoor minimum temperature encountered during the heating season is above 30° F., this requirement for inside surface temperature will not be met by the standard wall constructions commonly used for dwellings; and it will be necessary to add sufficient insulation to produce the desired result.

Quite often, complying with this specification also means that the economical thickness of insulation has been installed.[3] The architect or heating engineer should, however, make a thorough investigation of the controlling factors to determine if this statement holds true for the particular locality. The results of this investigation may be applied to future houses so long as there is no great change in any of these conditions.

These controlling factors are:

1. Length and severity of heating season (degree days).
2. Annual cost of fuel.
3. Reduction in initial cost of heating plant resulting from use of insulation.
4. Cost of insulation in place.

The economical thickness increases as the first three increase and decreases as the fourth increases.

B. MATERIALS AVAILABLE

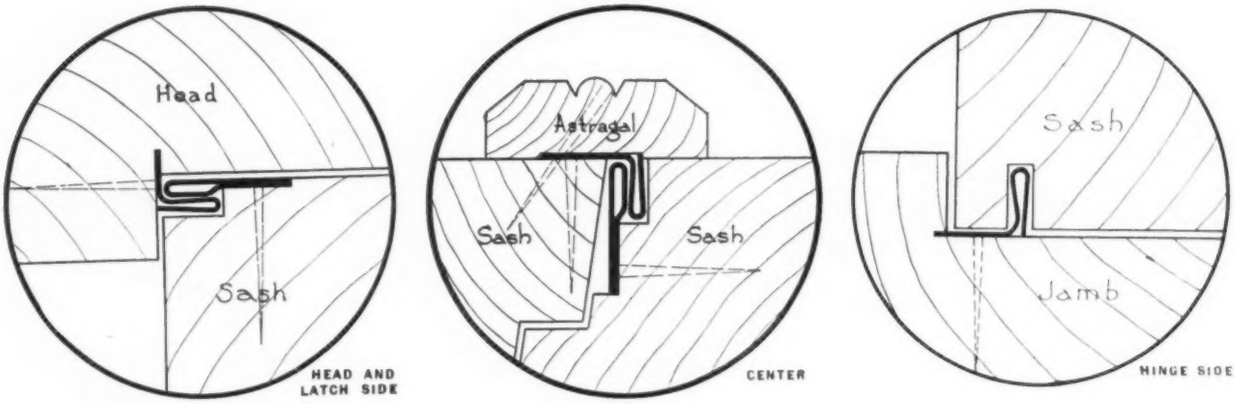
1. *Rigid or board form insulation:*
   a. Vegetable fibers of varied origin processed to form boards of low density (common thicknesses, 7/16", 3/4", 1", 1½" and 2").
   b. This material may be used in place of sheathing or lath; it is also available for interior finish.
2. *Blanket or flexible insulation:*
   a. Polished metallic foil.
   b. Vegetable or animal fibers quilted between two sheets of heavy kraft paper.
   c. Flexible materials are used solely for insulating purposes and best results are obtained when installed in air space construction so as to create one or more additional air spaces which are completely separated.[4]
3. *Fill insulation:*
   a. Generally a gypsum or limestone product resulting from the natural rock being subjected to some heat treating process to produce a wool-like material of low density.
   b. These materials possess no structural qualities and must generally be applied with considerable thickness, both because of a somewhat higher conductivity and because of the almost standard thickness of air spaces in frame walls.

C. COMPARATIVE COST

These insulating materials are listed approximately in the order of increasing cost of application and as long as the material meets the following additional requirements:

1. Durability,
2. Vermin proofness,
3. Moisture proofness,
4. Mechanical strength,
5. No increase in fire hazard, and
6. Non-odorous.

[1] Report of President Hoover's Conference on Home Building and Home Ownership—Vol. 5. *House Design, Construction and Equipment.*
[2] *Cold Walls and Their Relation to the Feeling of Warmth.* Houghten & McDermott. Heating, Piping and Air Conditioning, January 1933.
[3] *The Selection of Building Insulation.* Theo. F. Rockwell. THE ARCHITECTURAL RECORD, July and August 1933.
[4] University of Minnesota Engineering Experimental Station Bulletin No. 8. *Heat Transmission Through Building Walls. Rowley and Algren.*



The final choice should be dictated by economic considerations.

D. OTHER METHODS OF REDUCING HEAT LOSS

1. *Weather Stripping and calking*:[5]
   a. Seal all cracks back of window and door frames against air leakage. A plastic calking material placed on the outer surface is preferable.
   b. Provide weather stripping for all windows and doors to reduce infiltration.
   c. The use of calking material not only reduces heat loss, but also reduces cleaning expense by preventing the entrance of dirt-laden outdoor air.

2. *Double glazing:*
   a. Two new conditions are arising which will make double glazing more and more desirable as part of the original equipment of this class of house.
      (1) Forced circulation warm-air heating systems equipped with humidifiers are being installed in houses of this size. If the humidifier is to be used at all in cold weather, double windows become mandatory in order to prevent condensation.
      (2) A feature of modern architecture is the use of corner windows. The tendency is towards large areas of glass which, unless double-glazed, will make a considerable portion of the room very uncomfortable whenever the outdoor temperature is below 30° F. (Sunshine is not available during the most important hours of residence occupancy.)
   b. The simplest way to provide for double glazing is to design the window frame so that the storm sash will be readily interchangeable with the screen.

[5] Recommended minimum standard of construction.
[6] R. E. Waterfill. Railway Age. February 1931.
[7] A. S. H. V. E. *Guide* 1935.
[8] Year round industrial air conditioning is not to be included in this discussion.
[9] The heating season is the more important of the two for well over half the people of the United States.

II. HEATING METHODS

A. DEFINITION OF AIR CONDITIONING

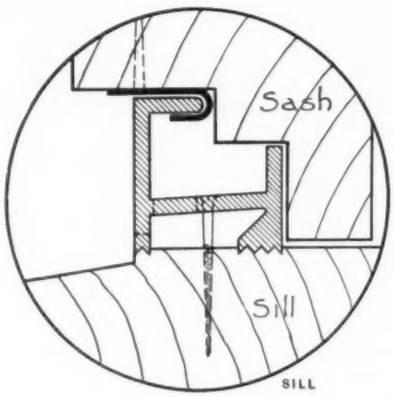
1. Air conditioning consists of the production and maintenance of all of the qualities of the air as near to the ideal as practicable for the service performed. These qualities include temperature, relative temperature, relative humidity, air motion, dust content, odor, purity, and noise level.[6]
   a. Both the definition and the term itself imply control. It is possible for such control to be manual, but in practically every case manual control would be neither as effective nor as reliable as the control accomplished by medium-priced automatic equipment now available.

2. The A. S. H. V. E. code for minimum requirements[7] permits systems which provide for the control of temperature, relative humidity, and air motion to be classed as air conditioners.

3. To make the term more flexible, it is commonly divided[8] into:
   a. Winter air conditioning. Minimum equipment provides for (1) heating, (2) humidification, (3) air motion.
   b. Summer air conditioning. Minimum equipment provides for (1) cooling, (2) dehumidification, (3) air motion.

4. All of the ordinary heating and ventilating devices—boilers, radiators, furnaces, heat exchangers, fans, filters, humidifiers, control equipment, ducts, grilles, dampers, and so on—are parts of a potential air conditioning system. But there is no air conditioning system until these parts, carefully selected for the loads they are to carry, have been properly arranged to respond to satisfactory control equipment.

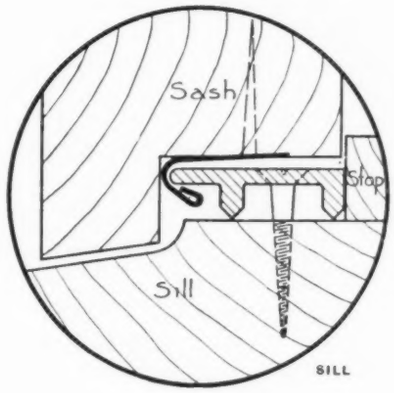
   Generally the purchase of more than extremely simple control systems, and arranging the equipment to respond to control, requires a greater initial expenditure than is warranted for a house of this price class. It is possible, however, to approach satisfactorily the ideal for winter air conditioning[9] and stay within the allowable first cost. (See forced circulation warm-air systems.)



(Left)
WEATHER STRIPPING FOR IN-OPENING CASEMENT WINDOWS:
Zinc or cold-rolled bronze.

WEATHER STRIPPING FOR OUT-OPENING CASEMENT WINDOWS:
Same types as for in-opening casements except that interior and exterior sides are reversed and sill stripping varies as shown.

Chamberlain Metal Weather Strip Co.



B. RELATION OF AIR CONDITIONING TO VENTILATION

1. Ventilation means the supply or removal of air to or from an inclosed space. The process may be induced by either natural or mechanical means, and the air may or may not be conditioned.[7]
2. Sufficient oxygen for the usual occupancy of this size house (seldom over 6) will be brought in by natural leakage.
3. Reasons for bringing in outdoor air:
   a. To reduce concentration of undesirable odors.
      (1) Kitchens.
      (2) Bathrooms.
   b. To remove excess heat whenever outdoor temperature is lower than the indoor temperature.

C. TYPES OF HEATING PLANTS

(Arrangement approximately in the order of increasing initial cost.)

1. *Warm air—gravity circulation:*
   a. Structural requirements:
      (1) House approximately square in plan; maximum dimension, 45′.
      (2) Basement, 7′ minimum clear height.
      (3) Locate furnace near center of basement.
      (4) Locate furnace chimney near center of house.
      (5) Space in inside walls for ducts.
      (6) Suitable location for return air grille.
   b. Fuels:
      (1) Hand-fired coal or coke.
      (2) Gas.
      (3) Oil.
2. *Hot water—gravity or forced circulation:*
   a. Structural requirements:
      (1) Basement not essential for hot water. Boiler may be located on same level as heated spaces. Use overhead supply. Give careful consideration to fuel storage when there is no basement.
      (2) Boiler does not need to be centrally placed.
      (3) Preferable to locate all risers in inside partitions. Dependent on floor framing.
   b. Fuels:
      (1) Hand-fired or coke. Magazine boilers for coke or anthracite coal.
      (2) Stoker-fired coal.
      (3) Gas.
      (4) Oil.
3. *Vapor systems (two-pipe):*
   a. Structural requirements:
      (1) Water line of boiler must be not less than 20″ below lowest radiator or heating unit. Requires basement or pitting of boiler.
      (2) Avoid placing return lines in spaces where temperature may fall below 35°.
      (3) Boiler need not be centrally located.
   b. Fuels: Same as for hot water.
4. *Forced-circulation warm air:*
   Note: The dividing line between the forced circulation warm-air heating system and the residential winter air conditioning system still remains a controversial subject. The item of equipment mentioned here, if provided with acceptable control devices, would constitute a winter air conditioning system.
   a. Structural requirements.
      (1) Geometry of floor plan is not a controlling factor as for gravity circulation.
      (2) Furnace may be located on same floor as heated space.
      (3) Furnace need not be centrally located.
      (4) Provide space in walls for risers. With forced circulation there is some advantage in placing supply grilles in walls 7 feet above floor. Consider relation of grille location to interior decoration.
      (5) Allow sufficient space around furnace and fan housing so that parts (fan, motor, filter, and the like) may be removed without requiring complete disassembly of the entire unit.
   b. Fuels[10]:
      (1) Hand-fired coal or coke. Magazine feed.
      (2) Gas. (Furnace designed for gas firing.)
      (3) Oil.

[10] Indirect systems using steam or hot-water heat exchanges will generally exceed the upper limit of allowable first cost as set in the introduction.

c. Component parts:
   (1) Furnace.
   (2) Fan. Ample volume and static pressure. Low speed for minimum noise.
   (3) Duct system. Supply: (a) prefabricated square or rectangular individual duct system; (b) made-to-order trunk duct system (higher priced). Return: (a) prefabricated duct parts; (b) made to order.
   (4) Humidifier. Type: (a) evaporating pan—float control; (b) spray nozzle.
   (5) Filter (optional but very desirable). Locate in return air connection. "Throw away" type or type which permits easy cleaning with usual household equipment.
   (6) Control. Room temperature: (a) air quantity (intermittent operation of fan); (b) air delivery temperature (by-passing part of air around heating surfaces). Combustion control: (a) reduce consumption of fuel; (b) improve temperature control. Humidity control.
   (7) Outside air intake (optional but desirable). To provide for some summer cooling by forcing cool night air through the house; manual control is sufficient. Requires variable control of fan speed: (a) adjustable speed motor; (b) change size of driving pulley.

D. NOTES ON RESIDENTIAL COOLING

1. Cooling by mechanical means is too expensive both in initial and operating costs for the class of house to which this check list refers. Additional first costs for cooling range from $300 upward[11] and operating costs start at $50 per season.[12]
2. Admitting the desirability of cooling residences in summer, the necessity of so doing remains a matter of opinion. This need is influenced by the severity of weather conditions (simultaneous conditions of dry and wet bulb air temperatures, wind velocity and sunshine) and length of cooling season. For most parts of the United States the "necessary" operation of mechanical cooling systems seldom exceeds 300 hours, whereas the heating season generally exceeds 4,000 hours and in a large number of places it is greater than 5,000 hours.[13]
3. The actual need for mechanical cooling in residences can be almost obviated by
   a. Judicious use of insulation in structure.
   b. Shading of windows on sunny side by awnings or venetian blinds.[14]
   c. Keeping doors and windows closed from 6:00 A.M. to 6:00 P.M. (sun time) on hot sunny days.[15]

To make these methods more completely effective, it is important that the house be well ventilated during the night. In practically all cases the daily minimum outdoor dry bulb temperature will be 10 degrees or more below the maximum inside temperature. Moving sufficient quantities of this outdoor air through the house will remove the heat stored up in the structure during the previous day.

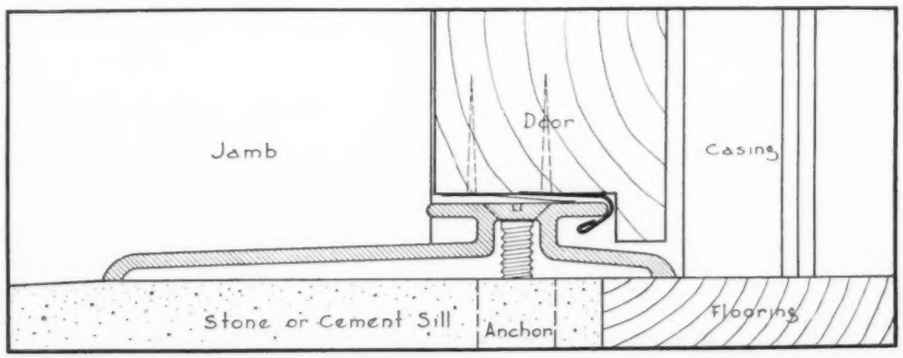
This ventilation may be accomplished by gravity (two-story houses with large openings in attic space) or by mechanical ventilation. The forced circulation warm-air heating system previously mentioned can be used for this work and in the radiator-heated home a propeller-type exhaust fan may be installed in the attic. These exhaust fans will not add much to the first cost, and the original plan of the house should consider the installation of such a fan even though the actual installation may be deferred for several years.

III. FUELS

A. INTRODUCTION

1. In nearly every case in a house of this size the final choice of fuel will be governed by the annual cash expenditure for fuel. And in determining this amount it is very questionable to price the householder's labor in an effort to make one of the "automatic" fuels appear more favorable.
2. Because of the great variation in the cost of fuel in different localities it is difficult to say what a reasonable annual expenditure for fuel should be; but if the estimated annual cost exceeds $100[15], additional insulation is easily justified.

[11] Ice tank and circulating pump.
[12] Helmrich and Tuttle. Heating, Piping and Air Conditioning. February 1933.
[13] Kratz and Konzo. Heating, Piping and Air Conditioning. February and December 1933.
[14] Houghten, Gutberlet and Blackshaw. Heating, Piping and Air Conditioning. February 1934.
[15] The method for estimating annual fuel cost is found in Chapter 29, A. S. H. V. E. *Guide* 1935.



WEATHER STRIPPING FOR EXTERIOR DOORS: Brass or aluminum. Illustration shows section for door sill; jamb and head sections similar to types for in-opening casements.

Chamberlain Metal Weather Strip Co.

B. FUELS AVAILABLE

1. Wood.
2. Coal. Coke.
3. Oil.
4. Gas.

Note: No attempt is made here to list fuels in any order with respect to their price, because the same order will not hold for all parts of the country. Coal will, however, be the lowest in price in many communities; and the difference will be enough so that, regardless of other disadvantages, it should not be eliminated from consideration for houses of this size.

C. CHARACTERISTICS OF DIFFERENT FUELS

1. *Coal:*
   a. Requires storage space (50 to 60. lb./cu. ft.).
      (1) Locate space so that coal may be transferred from truck to bin with minimum labor.
      (2) Location must also be properly related to arrangement of heating system. Minimum of 5 feet clear space in front of fire door. Door to coal bin near to fire door.
      (3) Make space large enough to hold season's supply if possible, because desirable savings may be effected by purchasing the season's supply during the summer.
   b. Burning:
      (1) *Anthracite.* Anthracite coal can be burned successfully without smoke in plants increasing in size from the kitchen range to large power boilers. It also has the property of burning for long periods of time without attention. This property makes it well suited for use in magazine-fed furnaces or boilers, which in anthracite districts will give a satisfactory approach to automatic combustion at a cost within reach of home owners of this class.
      (2) *Bituminous.* The present designs of furnaces for the smokeless combustion of bituminous coal generally result in combustion charges larger than are required by the houses under consideration. Many bituminous coals also tend to cake and shut off the air supply which means that the fire requires more frequent attention. Because of these properties, the firing of bituminous coal is somewhat dirty and the furnace is preferably located in a separate room which is not used for other living purposes.
   c. Stacks:
      (1) Furnace and heating boiler manufacturers hesitate to recommend their products if they are connected to stacks less than 30 feet high (vertical distance from grate bars to top of chimney). This requirement may preclude the use of house plans without basements unless the stack is carried to a considerable height above the roof line.

2. *Coke:*
   a. Storage:
      Requires somewhat larger volume because of lower density (28-30 lb./cu. ft.), otherwise problem is same as for coal.
   b. Burning:
      Coke burns in about same manner as anthracite coal and is also adapted to magazine feed.
   c. Stacks:
      Because of its porous structure, coke does not require as strong a draft as coal and may possibly be burned with lower stacks provided surrounding buildings are not higher than top of stack.

3. *Oil.*
   a. Storage:
      (1) Requires tank preferably buried in ground outside of house to reduce fire hazard. Filler pipe must be easily accessible to tank truck. Location of burner is not dictated by location of tank because oil can be easily piped to burner.
      (2) Volume of tank should exceed 400 gal. because oil companies offer a lower price (about ½ cent per gallon less) if quantity purchased at one delivery exceeds 400 gal. Storage should be sufficient to last through long periods of bad weather when delivery may be interrupted by icy roads or the like.
   b. Burning:
      (1) To burn oil efficiently, it must first be broken down to very small particles and thoroughly mixed with the right amount of air to produce complete combustion. At present this is best done by mechanical devices on which a lower limit of size is placed by practical considerations of construction and operation. This limit occurs in the neighborhood of 65,000 to 75,000 B.t.u./hr. of useful heat production.
      (2) Good engineering calls for the selection of a boiler or furnace designed especially for the burning of oil.
      (3) The noise caused by the burner should be given consideration in the final choice of burners.
      (4) The electrical energy required averages about 70 watt hours per gallon of oil. The cost of this energy must be considered when the annual cash expenditures for fuel are being estimated.
      (5) Both safety and economy make it mandatory that full automatic control of combustion be supplied with oil-fired heating plants.
   c. Stacks:
      (1) Lower stacks are permissible with oil because the induced draft required from the stack is less. Motor-driven fan supplies air for combustion. There is no fuel bed to offer draft resistance.

4. *Gas:*
   a. Storage:
      (1) None required.
      (2) Furnace or boiler location may be controlled by other features of floor plan rather than by fuel storage location.
   b. Burning:
      (1) Requires careful mixture of air and gas to prevent (a) waste of gas, (b) smoky combustion, (c) unsafe conditions.
      (2) Proper combustion conditions are brought about by (a) use of proper sized gas orifice, determined by manufacturer in cooperation with local gas company; (b) maintenance of proper supply pressure by a pressure governor; (c) proper adjustment of air shutter (inspection service offered by gas companies); (d) use of furnaces or boilers designed for utilization of gas fuels.
   c. Stack:
      (1) With modern gas appliances, the stack serves only to carry off the products of combustion, and the stack height may therefore be controlled by the architecture of building.

IV. UTILITY ROOM

A. PURPOSES

1. Provide a utility room in which all mechanical and electrical equipment may be located.
   a. Heating equipment.
   b. Cooling equipment, if any.
   c. Domestic hot-water heater.
   d. Fuel storage if solid fuel is used.
   e. Pipe shaft for
      (1) Water supply.
      (2) Drainage lines.
   f. Switchboard and fuse block.
2. Locate kitchen, bathroom and laundry as near utility room as possible.
   a. Plan kitchen and bathroom with common wall to carry water and waste lines.
   b. If either oil or gas is used for heating, the utility room may be enlarged to include laundry.

B. SIZE

1. Room must be large enough to contain all equipment without crowding to allow for
   a. Cleaning, servicing, oiling, and so on.
   b. Changing of filters.
   c. Adjustment of burners, dampers, control devices, and the like.
   d. Replacement of damaged or worn parts without complete dismantling of plant.
      (1) Clear space on one side equal to width of equipment measured in the same direction plus 1 foot.
   e. Firing of solid fuels and removal of ashes.
      (1) See "Fuels."
2. Space required in utility room by heating plants in order of increasing volume.
   a. Classified by *types*:
      (1) Steam and hot water.
      (2) Gravity circulation warm air.
      (3) Forced circulation warm air (winter air conditioning).
   b. Classified by *fuels*:
      (1) Coal—hand- or stoker-fired.
      (2) Oil.
      (3) Gas.
3. Door large enough to pass largest piece of equipment which is shipped as a unit.

C. AIR SUPPLY; ASH REMOVAL; LIGHTS

1. In small houses using utility rooms the air for combustion may be easily supplied by louvers in the door or by cutting off the bottom of the door (1″ to 2″ above floor).
   a. This air can be made up by leakage and will also help produce the necessary ventilation for a small house.
2. *Ash removal—solid fuels:*
   a. Provide covered storage cans for ashes.
   b. If possible bury can in floor just in front of ash pit door. Make top of can flush with fire room floor. Provide foot-operated cover.
   c. Make all other openings (for pipe, ducts and conduit), except air supply, dust-tight. Special attention must be given to those openings at the top of the room. Air motion will tend to be inward in lower portion of room.
3. Have room well-lighted. Paint walls and ceiling a medium light color.

D. DOMESTIC HOT-WATER HEATING

1. *Methods:*
   a. Coil placed in furnace or boiler connected to insulated storage tank.
      (1) In case of oil or gas, the combustion control may be so arranged that the heating plant may be operated the year round to supply hot water. Additional control and valves increase initial cost.
      (2) Separate gas-fired coil heater for summer use.
   b. Coil heater and insulated storage tank for year round use.
      (1) Fuels: (a) gas with automatic control, without automatic control; (b) anthracite coal or coke; (c) kerosene.
   c. Instantaneous gas-fired coil heater.
   d. Electrically heated insulated storage tank.
      (1) Equipped with time switch, thermostat, and separate meter, for use of "off-peak" energy.
2. *Selection:*
   a. Governed by fuels available in each locality, and by their relative costs.

ELECTRICITY FOR THE HOUSE

A CHECK LIST OF OPTIMUM ELECTRICAL FACILITIES FOR A SIX-ROOM DWELLING

By HENRY L. LOGAN, Engineering Consultant

A sensible (optimum) degree of electrification of the home in any given case will be dependent principally on:

(1) local power rates;
(2) the degree to which the electrical facilities will be used, *i.e.*, family habits.

As local power rates steadily decrease the amount of electricity the user can afford to consume increases. This process can be anticipated to some extent in planning home electrification.

High power rates not only discourage consumption but also restrict the installation of electrical facilities owing to the assumption that expanded facilities mean proportionately increased consumption. This is not necessarily so, depending on family habits and the physical characteristics of the home.

To illustrate this point two cases are cited:

Case A

Six-room house on plot, frontage 130 feet, depth 80 feet. Family of three. Both parents away most of each day; child at school or out with parents. Thirty-two windows. Total connected load, 9 kilowatts. Average monthly consumption, 150 kilowatts.

Case B

Six-room house on plot, frontage 50 feet, depth 100 feet. Family of five. Mother home most of the time. Entire family home a fair percentage of the time. Twenty windows. Nearby buildings shadow home. Total connected load, 6.3 kilowatts. Average monthly consumption, 420 kilowatts.

These cases show that the amount of daylight admitted into the home, the size of the family, and the extent to which the family uses the home, are the principal factors in the size of the electric bill. There is only an indirect relationship between the total connected load and the amount of electricity used, but a very direct tie-up between the total connected load and the work-saving conveniences of electricity. The latter are low-powered and intermittent or momentary in their operation, adding little to the monthly bill but a great deal to the comfort and the convenience of the occupants of the house.

Stating it differently, the average home has a connected load of 3 kilowatts and a total of 65 electric outlets of all kinds. An "adequately electrified" home,* with a connected load eight times greater (24 kilowatts), and four times as many electric outlets (260), would not consume from four to eight times as much current, but only from two to three times as much.

OPTIMUM CIRCUITS:

Six *main circuits*, plus one additional when electric range is used, and two additional (total of 8) if oil burner or air conditioning equipment is installed. Usual distribution:

2 circuits from service equipment control panel to circuit breakers in cellars
2 to circuit breakers on first floor and
2 to circuit breakers on second floor; plus
1 additional in cellar from service panel to air conditioning panel (when used), and
1 from service panel to electric range on first floor (when used).

Fourteen *sub-circuits* if no air conditioning equipment, otherwise 8 additional. Usual distribution:

4 from cellar circuit breakers
6 from first-floor circuit breakers, and
4 from second-floor circuit breakers.

Main circuits should be No. 10 A.W.G. conductors, except those to electric range and air conditioning panel which should be 3 No. 8 A.W.G. Sub-circuits should be No. 12 A.W.G.

For available types of standard conductors and conduits, refer to pages 454 and 455 of THE ARCHITECTURAL RECORD for May 1934.

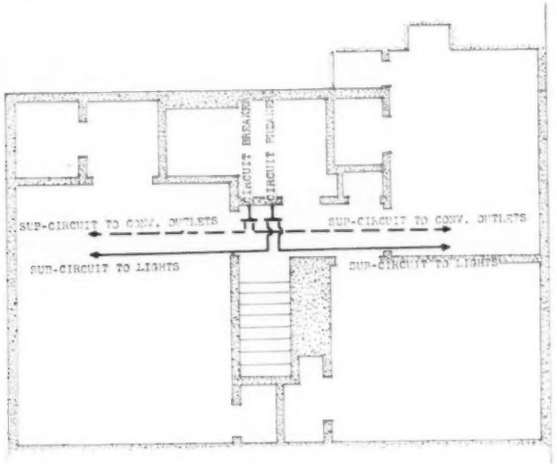
CIRCUIT BREAKERS:

Two in cellar, plus 1 if electric range is used, and another if air conditioning equipment is installed: 4 in all. Two on the first floor. Two on second floor: located 5 feet from floor and not more than 25 running feet from service panel.

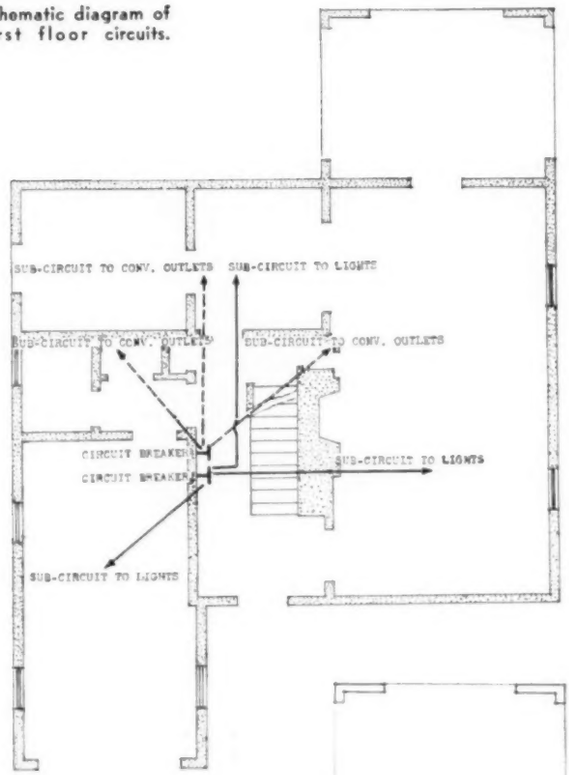
*See pages 449 and 450 of THE ARCHITECTURAL RECORD for May 1934.

ELECTRICAL LAYOUT FOR GENERAL ELECTRIC "NEW AMERICAN HOME"

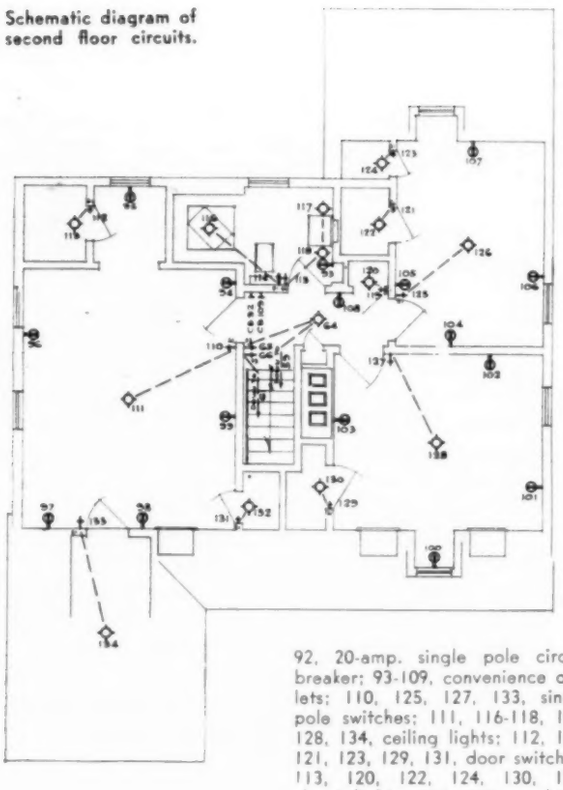
ROYAL BARRY WILLS, Architect



Schematic diagram of first floor circuits.

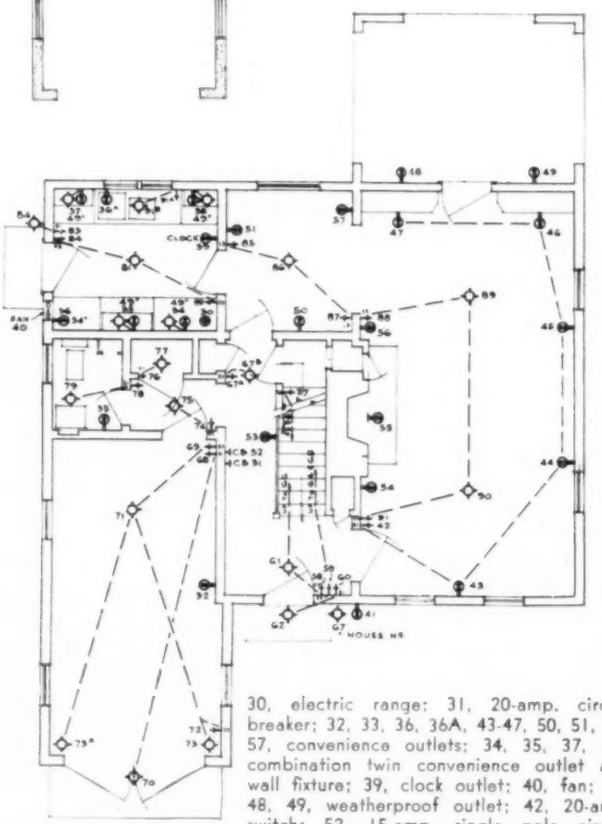


Schematic diagram of second floor circuits.



92, 20-amp. single pole circuit breaker; 93-109, convenience outlets; 110, 125, 127, 133, single pole switches; 111, 116-118, 126, 128, 134, ceiling lights; 112, 119, 121, 123, 129, 131, door switches; 113, 120, 122, 124, 130, 132, closet lights; 114, 115, combination (2) single pole switches.

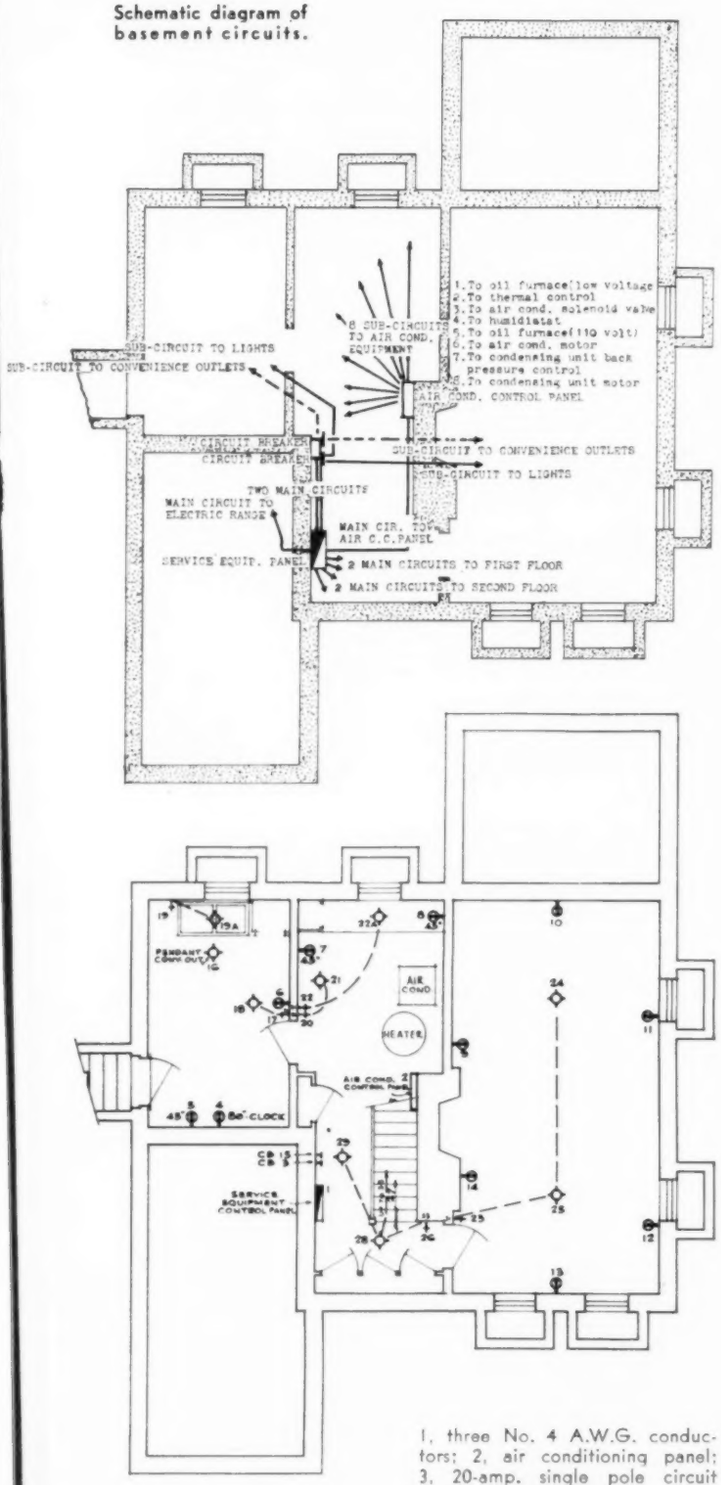
SECOND FLOOR



30, electric range; 31, 20-amp. circuit breaker; 32, 33, 36, 36A, 43-47, 50, 51, 53-57, convenience outlets; 34, 35, 37, 38, combination twin convenience outlet and wall fixture; 39, clock outlet; 40, fan; 41, 48, 49, weatherproof outlet; 42, 20-amp. switch; 52, 15-amp. single pole circuit breaker; 58-60, (2) 3-way and (1) single pole switch; 61, 62, 64, 67B, 70, 71, 73, 73A, 75, 79, 81, 84, 86, 89, 90, 91B, ceiling lights; 65, 66, combination (2) 3-way switches; 67, wall light for house number; 67A, 74, 78, 91A, single pole switches; 68, 69, 82, 83, (1) 3-way and (1) single pole combination switches; 72, 80, 85, 87, 88, 3-way switches; 76, door switch; 77, closet light.

FIRST FLOOR

Schematic diagram of basement circuits.



1, three No. 4 A.W.G. conductors; 2, air conditioning panel; 3, 20-amp. single pole circuit breaker; 4-14, twin convenience outlets; 15, 15-amp. single pole circuit breaker; 16, pendant convenience outlet; 17, 19, 23, single pole switches; 18, 19A, 21, 22A, 24, 25, 28, 29, ceiling lights; 20, 22, combination (2) single pole switches; 26, 27, 3-way switches.

BASEMENT

OUTLET BOXES:

Optimum number, 48, usually distributed:
Cellar, 8.
First floor, 27.
Second floor, 13.

Waterproof, adjustable floor boxes in masonry floors; utility floor boxes in wood joist floors. Side wall and ceiling boxes should be provided with fixture studs and covers. Outside boxes should be weatherproof.

SWITCHES

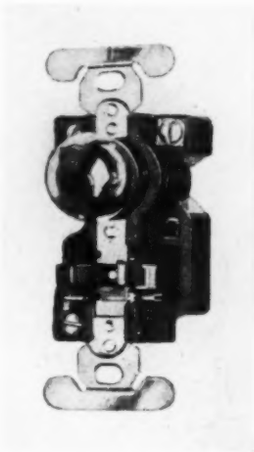
Optimum number, 39, distributed as follows:

PLACE	SINGLE POLE	STEP-SAVER	MER-CURY	DOOR
Cellar	6	2	—	—
First Floor	8	6	—	1
Second Floor	5	2	3	6

Four types: (1) single pole, flush tumbler; (2) "stepsaver" (three-way and four-way); (3) silent action mercury; (4) "door" switches.

"Telltale" lights should be provided on switch plates and convenience outlets, controlling or serving silent equipment, or controlling or serving lights that cannot be seen from the switch or outlet location.

Mercury switches should control the nursery and night lights.



Combination single pole flush tumbler switch with "telltale" or pilot light.

CONVENIENCE OUTLETS

Twin (duplex) outlets.

Optimum number, 44: 11 in cellar, 15 on first floor (plus 2 weatherproof outlets), 16 on second floor.

Fan hanger outlets: 4 (for living room and each bedroom).

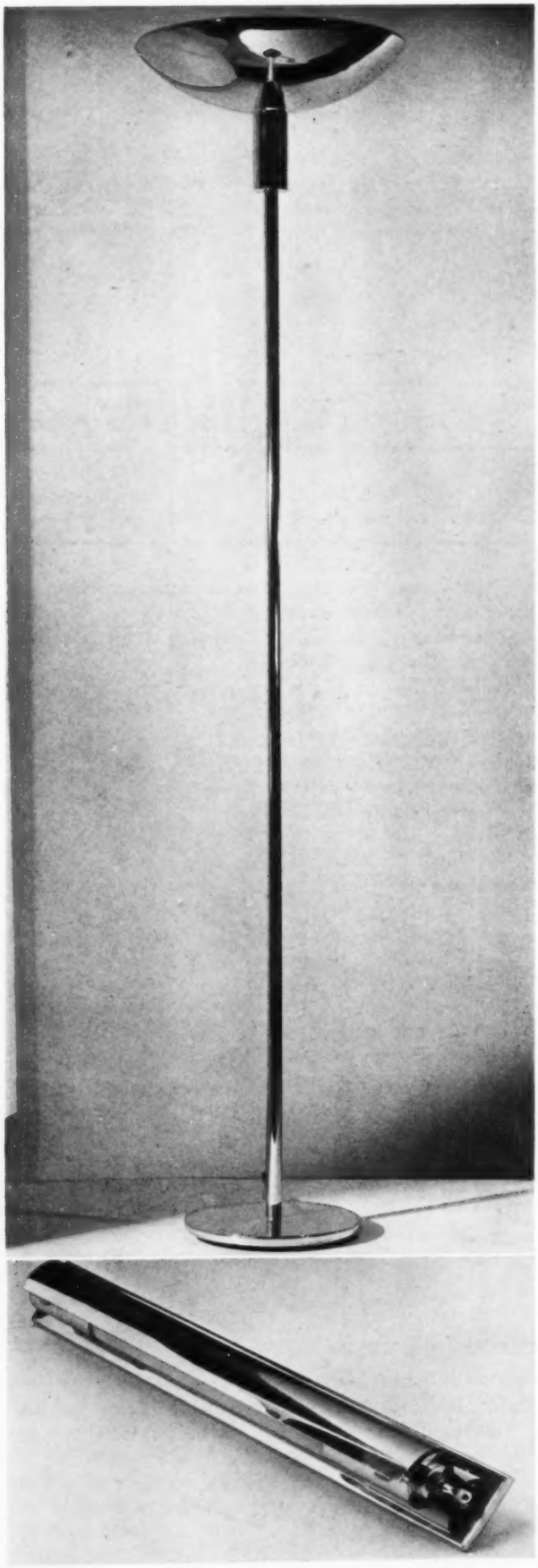
Electric wall clock hanger outlets: 4 (laundry, kitchen, living room and master bedroom).

SPECIAL CIRCUITS

Rubber-covered fixture wire for low-voltage circuits: bells, annunciators, thermostats, and the like.

Electrical metallic tubing for public telephone extensions and radio circuits.

Rigid conduit for protective, signaling and voltage control device circuits, where tampering would endanger operation.



Lighting fixtures designed by Kurt Versen: (above) pendant lights; (upper left) floor lamp for indirect lighting; (lower left) wall and over-bed light.

FIXED ELECTRICAL EQUIPMENT

All year round *air conditioning equipment* consists of a furnace (usually an oil or gas burner), and "air conditioner," evaporators, filters, ducts, condenser and controls. The space requirements of such equipment for a six-room insulated house in the latitude of lower New York State are given in Diagram 1. A schematic elevation is shown in Diagram 2.

Winter air conditioning consists of means for heating, humidifying, cleaning and circulating the air. Summer air conditioning adds cooling and dehumidifying to these processes. Therefore, if winter air conditioning only is required, the evaporators, condenser and allied ducts and controls can be omitted.

The lack of summer air conditioning in houses with attics can be partially met by installing an air circulator in the attic. It operates by inducing a forced circulation of air through the attic during the day, substantially eliminating the heat leakage effect into the living quarters due to the hot sun on the roof; as the sun declines and the outside air temperature decreases, the cooling effect is increased, as it draws the cooler outside air through the living quarters, reducing the heat stored in the house. The apparatus is approximately 25″ square and 15″ deep. It is supported on legs at the proper height suitable to the conditions, never more than 48″ to top of equipment.

ELECTRICAL KITCHEN

Refrigerator: Electrical refrigerators suitable for use in a six-room house vary in over-all dimensions:

CUBIC CAPACITY	TYPE	HEIGHT	FLOOR SPACE	
			WIDTH	DEPTH
5.0	monitor	64¼"	24"	21½"
5.3	flat top	52¾"	26¾"	23"
7.0	monitor	65¾"	29"	22¾"
7.2	flat top	56¾"	29½"	25¼"
9.0	monitor	68¼"	34¼"	26¼"
10.7	monitor	65¼"	44¾"	25¾"

Electric ranges: The floor space required by suitable electric ranges varies from 42" to 45¾" in length, and from 26" to 27½" in depth. The height varies from 41¼" to 55½".

Electric dishwashers: Combination dishwasher and sink cabinets take up the following floor space: from 44½" to 79½" in length, and 25" in depth. They vary from 35" to 36" to the counter level.

ELECTRICAL LAUNDRY

Washers: Floor space required is given in the following table:

TYPE	WIDTH	DEPTH
6 pound	26½"	26¼"
7 pound	26¼"	26¼"
	26¼"	26¼"
8 pound	34½"	21½"
	35½"	24"
	24¾"	24¾"
9 pound	25¾"	25¾"

Flatplate ironers require 56" x 20" floor space, when not in use. In use they require about 80" x 32".

Electric driers are 60" wide, 24¾" deep, 72" high and increase in width, when open, to 108". For convenient operation a floor space of 10'0" x 2' ¾" should be provided.

Diagram No. 3 illustrates a minimum space layout for an electrical kitchen and laundry.

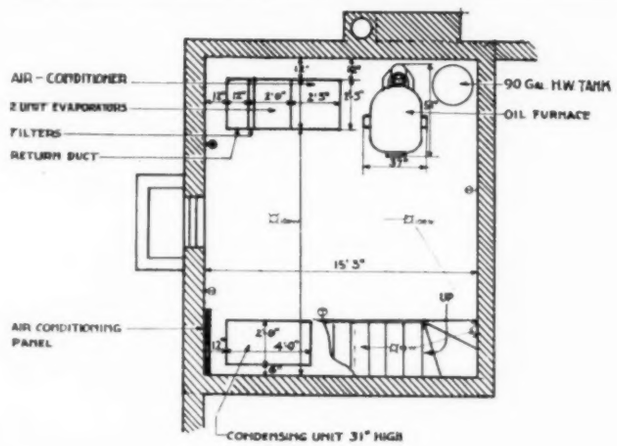


Diagram 1 — AIR CONDITIONING LAYOUT

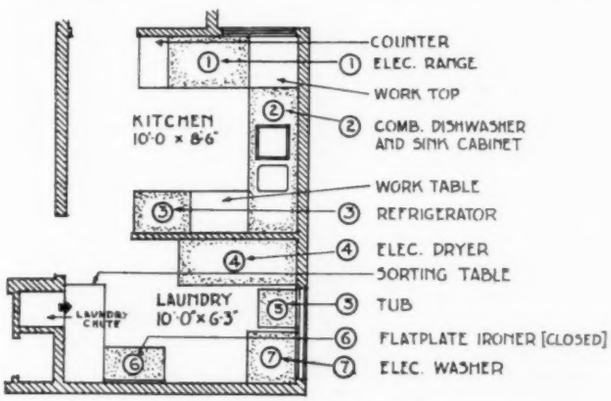


Diagram 3 — ELECTRICAL KITCHEN AND LAUNDRY

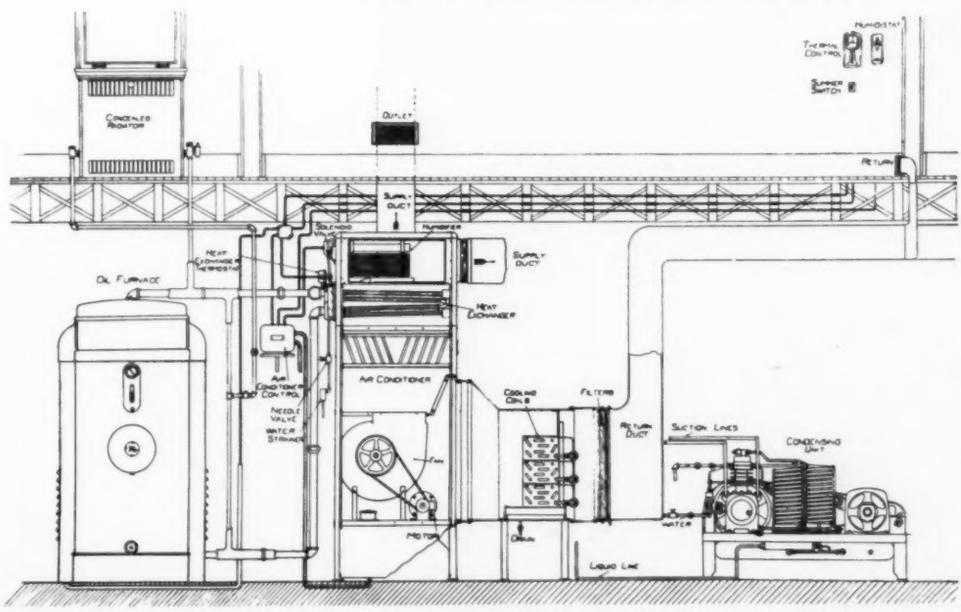
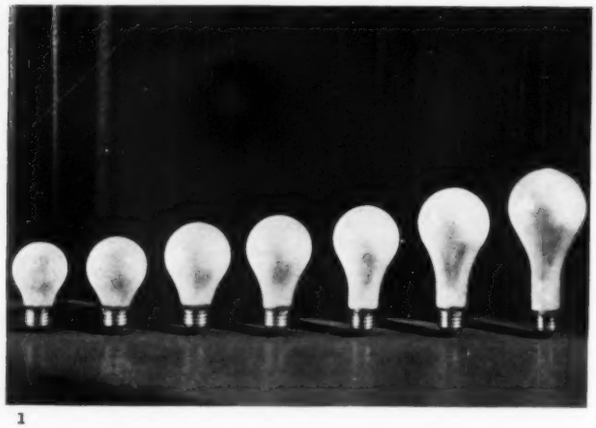


Diagram 2 — Schematic elevation of air conditioning equipment. Courtesy of General Electric Co.



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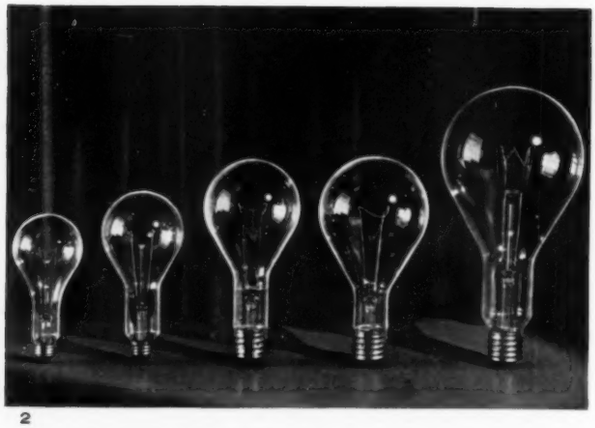

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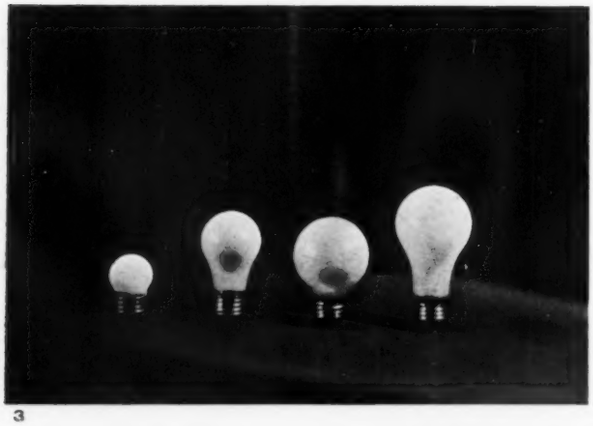

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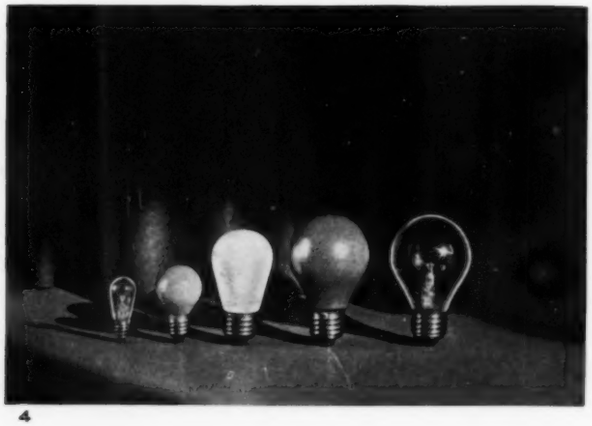

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5

SUGGESTED LIST OF PORTABLE APPLIANCES

APPLIANCE	CONSUMPTION	APPROX. COST PER HOUR
4 Clocks	2 watts each	$0.0001
1 Cooker	475 watts	.025
1 Curling Iron	20 watts	.001
1 Coffee Maker	550 watts	.025
2 Flat Irons	660 watts each	.033
1 Flat Iron	1000 watts each	.05
1 16" Fan	60 watts	.003
3 8" Fans	25 watts each	.001
2 Heating Pads	60 watts each	.003
1 Mixer	70 watts each	.0035
1 Infra-red Lamp	250 watts	.0125
1 Radio, 8-tube	100 watts	.005
1 Radio, 5-tube	100 watts	.005
1 Sewing Machine	65 watts	.003
1 Sun Lamp	400 watts	.02
1 Toaster	500 watts	.025
2 Floor Cleaners	50 watts each	.003
1 Waffle Iron	700 watts	.035

Additional Appliances that may be desirable in individual cases:

2 Fan Heaters (or other portable electric heaters).
1 Razor Blade Sharpener.
1 Soldering Iron Kit.
1 "Electric Workshop."

GENERAL ELECTRIC LAMPS

(1) General house lighting service. Lamps illustrated are 15, 25, 40, 60, 75, 100, 150 watts, inside frosted.

(2) Clear bulb lamps—150, 200, 300, 500, 750-1000-1500 watts—for indirect lighting.

(3) Type D lamps, priced at 10 cents each—7½, 15, 30, 60 watts.

(4) Clear, inside colored, tinted and frosted Mazda lamps for decorative lighting—6, 10, 6 and 10, 25, 25 and 50 watts.

(5) Outside coated flame shape and round bulb Mazda lamps for decorative luminaires—15, 25, 25 and 40 watts.

OPTIMUM LIGHTING

Ordinary daylight intensities are up in the thousands of foot-candles. Average residence lighting is from one to three; that is, it is around 1/1000 or less of the intensity of natural lighting.

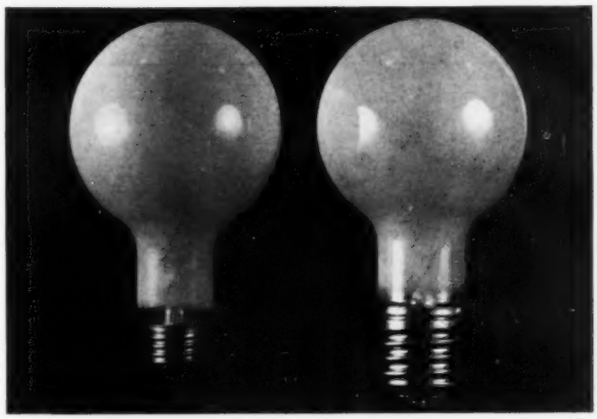
Daylight intensities are not economically feasible. Fortunately the eye can see effectively at much lower levels, although a person benefits, both visually and hygienically, from much higher levels than he can afford to pay for. In short, all we can establish is a minimum below which we should not go. This minimum is largely a matter of deciding what is actually attainable by home owners in general. In the opinion of the writer this minimum is 10 foot-candles, which requires a total connected lighting load for the average six-room house of 4 to 5 kilowatts.

It should be distributed as follows (approximately):

Cellar	0.5 kilowatt.
First Floor	2.4 kilowatts.
Second Floor	1.6 kilowatts.

The type of lighting equipment selected will greatly affect the wattage required. This is shown in a table published on page 62 of the July 1934 issue of THE ARCHITECTURAL RECORD.

Certain areas in the home require much higher lighting than other areas:



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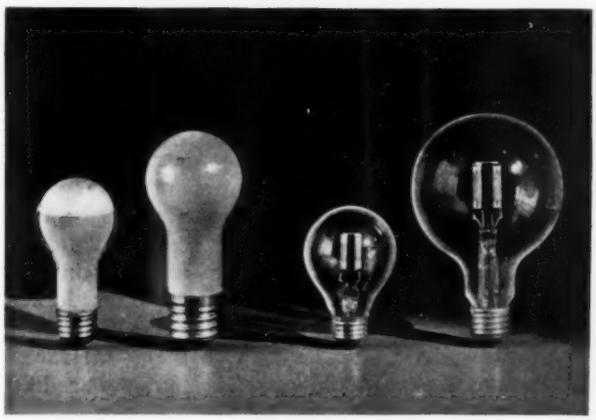


9

GENERAL ELECTRIC LAMPS

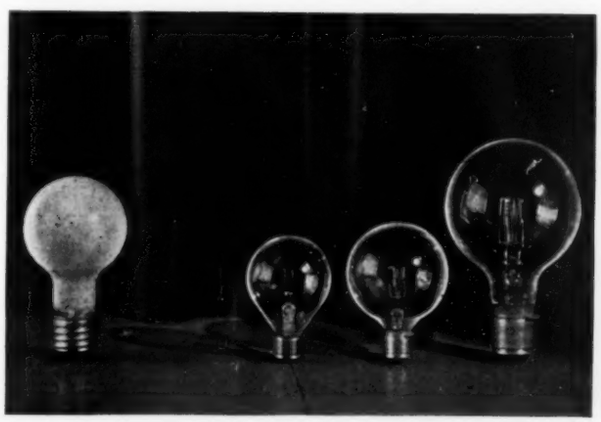
(6) Tubular bulb Mazda lamps with conventional screw base—25, 25, 50 watts.

(7) Mazda lumiline lamps with disk bases—40, 40, 30 and 60, 30 and 60 watts.

(8) Mazda Three-lite lamp for indirect portables and wall urns — 100-200-300 watts — and spotlight service lamps — 100, 250 and 400, 1000 watts.

(9) Mazda sunlight lamps for use where a combination lamp emitting ultraviolet radiation and considerable light is desired, and Type G lamps where much light is not essential.

(10) Mazda indirect lite lamp and Mazda three-lite lamp.



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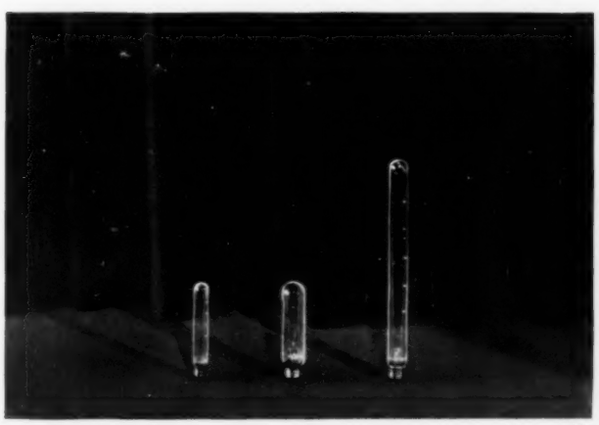

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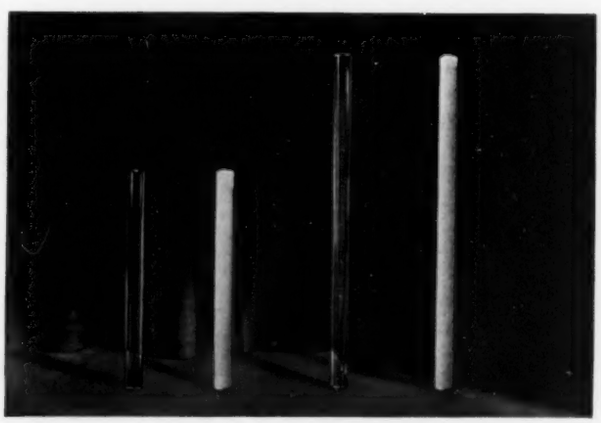

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LOCATION	MINIMUM LIGHTING INTENSITY
Kitchen:	
Sink	20 foot-candles
Range	
Work counter	
Laundry:	
Tub	20 foot-candles
Ironer	
Ironing board	
Garage:	
Car motor	40 foot-candles
Work bench	20 foot-candles

Reading: not less than 25 foot-candles, which can now be secured by using the new types of study lamps generally available.

FIXTURES

Ceiling type fixtures are preferable to brackets. Their location results in a better distribution of the light and less interference with vision. They should either entirely inclose the lamps or so screen them that the latter are not visible under ordinary conditions.

The flush built-in ceiling type requires the least maintenance, if well constructed; it increases the feeling of spaciousness so desirable in the rooms of a small house, and is necessary as a safety measure in earthquake regions where suspended fixtures are likely to be shaken down.

LAMPS

The photographs on pages 142 and 143 illustrate the types of lamp available for home service, and the particular service to which they are best adapted.

SAFETY REQUIREMENTS

If the requirements of the National Electric Code of the National Board of Fire Underwriters are fully complied with, the electrical installation will not present a fire hazard. However, carelessness during construction is often responsible for hidden hazards that show up later.

Pinching armored cable under a joist and putting nails through flexible conduit are two common causes of later trouble.

Leaving surplus wire coiled and rubbing together in the canopies of ceiling fixtures, where the heat of the lamp can gradually bake the "life" out of the insulation, is a common cause for "shorts" that begin to show up after the house has been in use a few years.

Convenience receptacles of poor quality frequently develop "shorts" after very little use.

PRECAUTIONS AGAINST ELECTRIC SHOCK

If the requirements of the Fire Underwriters have been met the owner is reasonably protected against the hazard of electric shock. Compliance with these requirements cannot protect the owner against his own carelessness, however, and as electric shocks in the home are frequently connected with the bath tub, it is well to place convenience outlets, switches and fixed electrical equipment sufficiently distant from the tub to make impossible an electrical contact while the owner is in it.

If the floor of the laundry is cement and not covered with some insulating material, the work space should be covered with a wooden slat floor to prevent the worker with wet hands being grounded when making electrical contact. A wet insulated floor with a drain in it doesn't insulate. The laundry equipment should be fitted into a continuous, tight, counter surface, with splash boards to reduce the spilt water to a minimum.

Children occasionally receive burns by pushing hair pins into convenience outlets. Outlets with spring flap or screw type covers that successfully defy little fingers are available. Only instruction can protect the older children.

Convenience outlet with screw cover.

Extension cords frequently "short" and become a fire hazard when they are laid under carpets or furniture and the abrasion breaks down the insulation, or when they are long enough to kink. If convenience outlets are located with sufficient closeness (5 feet apart), long cords will not be necessary. They should never be longer than 6 feet. A cord over the regulation length that causes a fire may be sufficient to invalidate the insurance protection.

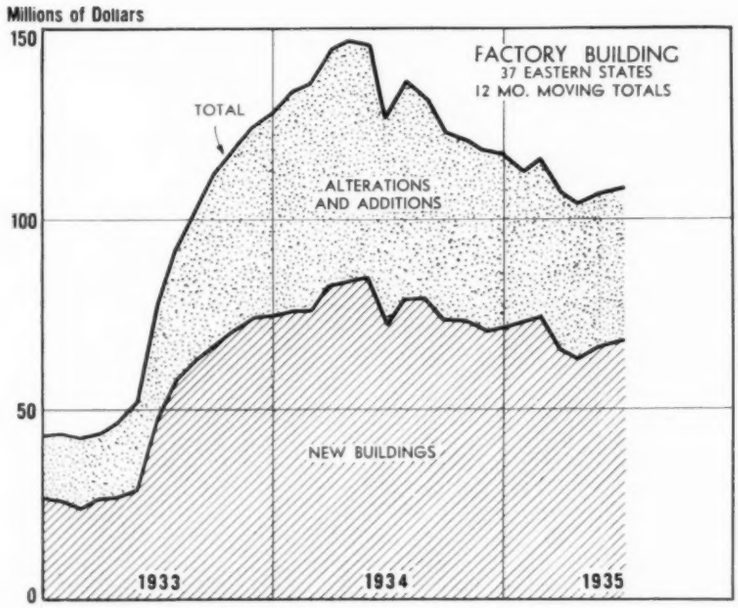
REFERENCE PUBLICATIONS:

"National Electric Code" of the National Board of Fire Underwriters.
Croft's handbook on "Wiring."
Cushing's "Standard Wiring."
GESCO Catalog.
GESCO "Lighting Handbook."
GRAYBAR Catalog.
WESCO Catalog.

BUILDING TRENDS AND OUTLOOK

By L. SETH SCHNITMAN, Chief Statistician, F. W. Dodge Corporation

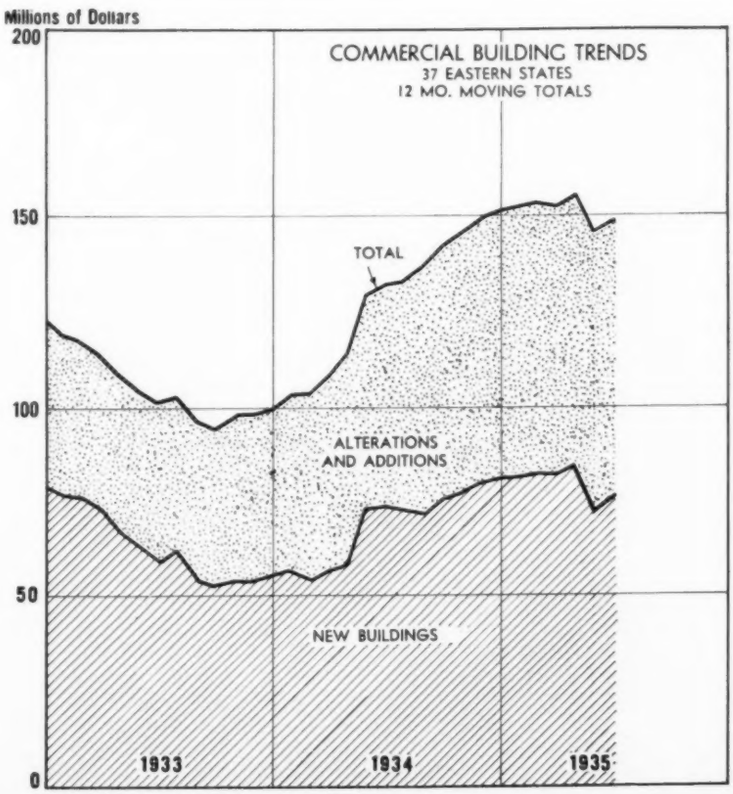
IMPROVED FACTORY AND COMMERCIAL BUILDING PROSPECTS



FACTORY BUILDING

The volume of factory building usually bears a measurable relationship to industrial production. This is particularly true as to directional movements, although the amplitude of the movements is likely to be much more severe in factory construction than in manufacturing production, and although the timing of the two involves a lag of some months.

Broadly, it is customary for major swings in residential building to precede similar swings in general business activity. It is only after major movements in general business have become rather well-defined that similar movements become apparent in factory construction. In 1933 the unaccustomed occurred. Legalization of beer provided the stimulus with which factory building improvement began, simultaneously with gains in general business. This was reflected both in new buildings and in alterations for existing structures. Since the spring of 1934, factory building, both new and alterations, has trended irregularly lower although at mid-year 1935 the volume for the previous twelve months was more than twice the total for the twelve months ended December, 1932. The stage now appears set for an early reversal of the recent declining tendency, since there are significant indications of an expanding level of industrial production which in the last analysis is a fundamental cause of factory expansion.



COMMERCIAL BUILDING

While factory building started on its upward course in mid-1933, commercial building failed to reverse its decline until late in 1933, as can be seen from the accompanying chart. Once having started upward, the curve of commercial building construction has continued to rise almost uninterruptedly.

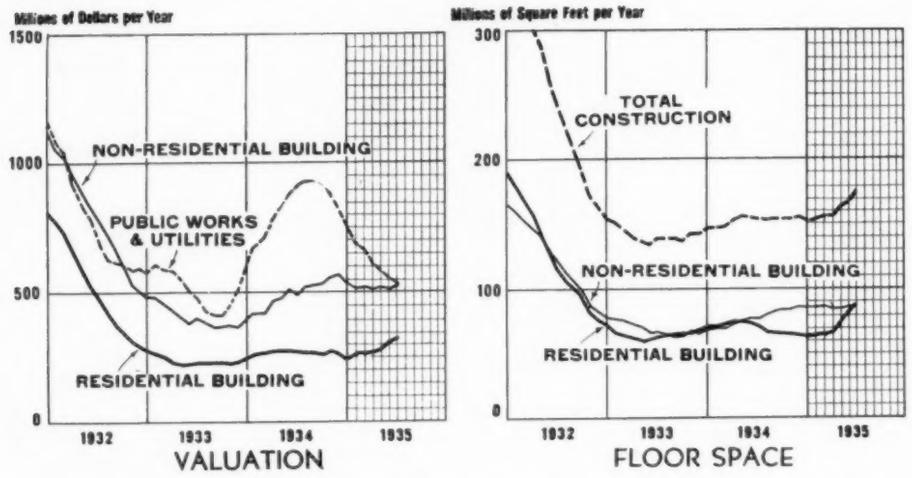
The principal source of improvement has recently come in modernization and additions to existing structures, such as stores, office buildings, and commercial warehouses.

With an expanding volume of commercial business reflected by such organizations as department stores, chain stores, small independent merchants, many of whom are enjoying greater business than in months, there is reason to believe that the improving tendency in commercial building should continue with only minor interruptions.

Gains in commercial building contracts for both new and alteration projects have been in evidence in most major geographic areas in the territory east of the Rocky Mountains; for most districts further substantial improvement should occur.

It is now becoming increasingly evident that income-producing commercial structures require continuous modernization and improvement to make them attractive to existing and prospective tenants. Availability of insured modernization loans up to $50,000 under the Amended National Housing Act should give further stimulus to this class of project.

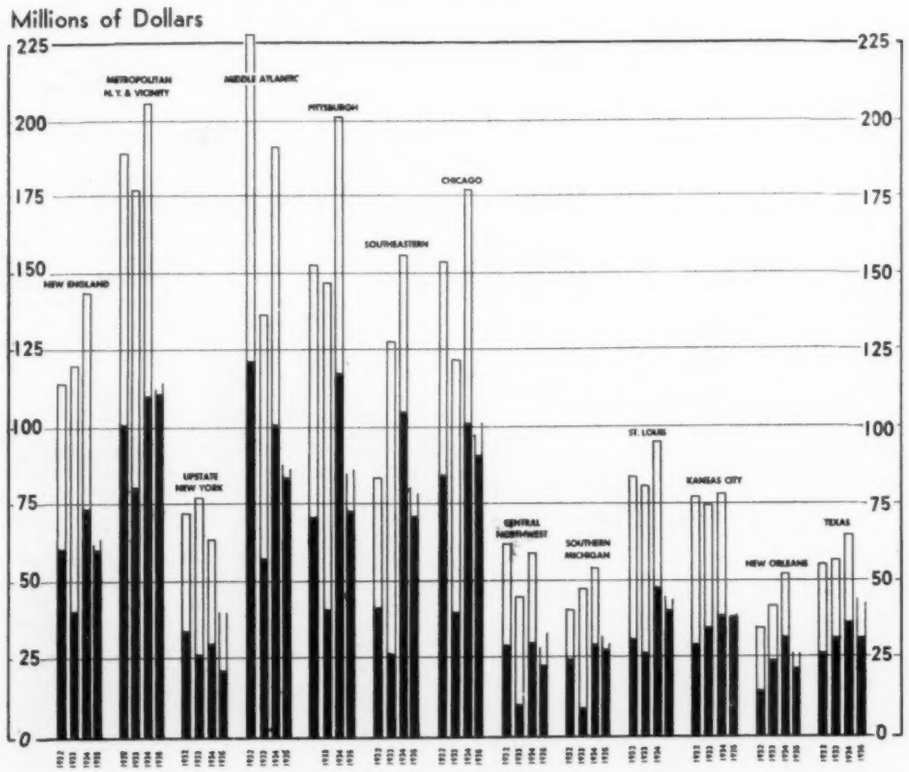
CONTRACTS FOR CONSTRUCTION: 37 Eastern States



Curves plotted as 12-month moving totals. The figure plotted for a given month, in the curves above, represents the total for the twelve months ending with that month. This type of chart thus registers the trend of a given movement and effectively eliminates seasonal influences; a rise in a given curve signifies that the figure for that month was higher than the figure for the corresponding month of the previous year. Conversely a decline in any curve signifies that the total for the plotted month was below that for the corresponding month, a year earlier.

From the accompanying charts it will be seen that residential building contracts covering the twelve months ended June 30, 1935, were valued higher than for any other consecutive twelve-month period since those ended in the fall months of 1932. For non-residential building the current position of the curve is somewhat below the twelve-month total ended November 30, 1934, but the volume is well above the low ebb total reached late in 1933. For public works and utilities of engineering design, the contract curve has been declining since mid-1934; this has occurred because of a slowing down in the PWA program. Now that the new Work-Relief Program is getting under way a reversal in trend will likely occur. Because of this continued decline in the value of engineering contracts let, the moving-total curve for this class was, at mid-1935, at approximately the same level as non-residential building; such has not been the case in almost three years. This realignment in the relative importance of major classes is of interest in that a general recovery for the construction industry as a whole usually occurs only when the relationship between the classes is closer than that which is yet the case.

CONSTRUCTION CONTRACTS: Major Geographic Districts



Coverage: 37 Eastern States. Bars indicate annual totals for each year from 1932 to 1934, inclusive. Bar for 1935 covers first six months only. Black portions of bars show cumulative totals through June of each year for direct comparison with the totals for 1935 to date.

Construction activity even in good times varies somewhat widely by geographic areas. In the accompanying chart the variations in recent years are shown for each major area east of the Rocky Mountains. For the Metropolitan Area of New York the cumulative volume of construction awards of all types through June 30, 1935, was greater than for any similar six months charted; this was due entirely to improvement in the residential field. For the Kansas City territory the volume of awards during the first six months of the current year, in approximating the level for the first six months of 1934, was likewise higher than for any other charted six-month period; gains in this district over 1934 were shown for residential and non-residential building and in public utilities but a loss was registered for public works of engineering design.

For the remaining 11 districts the contract totals for construction covering the initial half of 1935 were lower than were shown for the corresponding period of 1934, chiefly because of losses in engineering types. For the New England, the Metropolitan Area of New York, the Southeastern, the Chicago, the Southern Michigan, the New Orleans and Texas districts it is likely that the contract totals for all of 1935 may exceed their respective volumes reported for 1932; it is doubtful whether any territory, with the possible exception of Metropolitan New York, Southern Michigan and Kansas City, will show a contract volume for all of 1935 in excess of their 1934 totals.